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MLB/SERV (MOTOR LIFE BOATS/SURFACE EFFECT RESCUE VEHICLES) OPERATION STUDY

MLB/SERV Unit

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MLB/SERV OPERATION STUDY

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San Francisco, California

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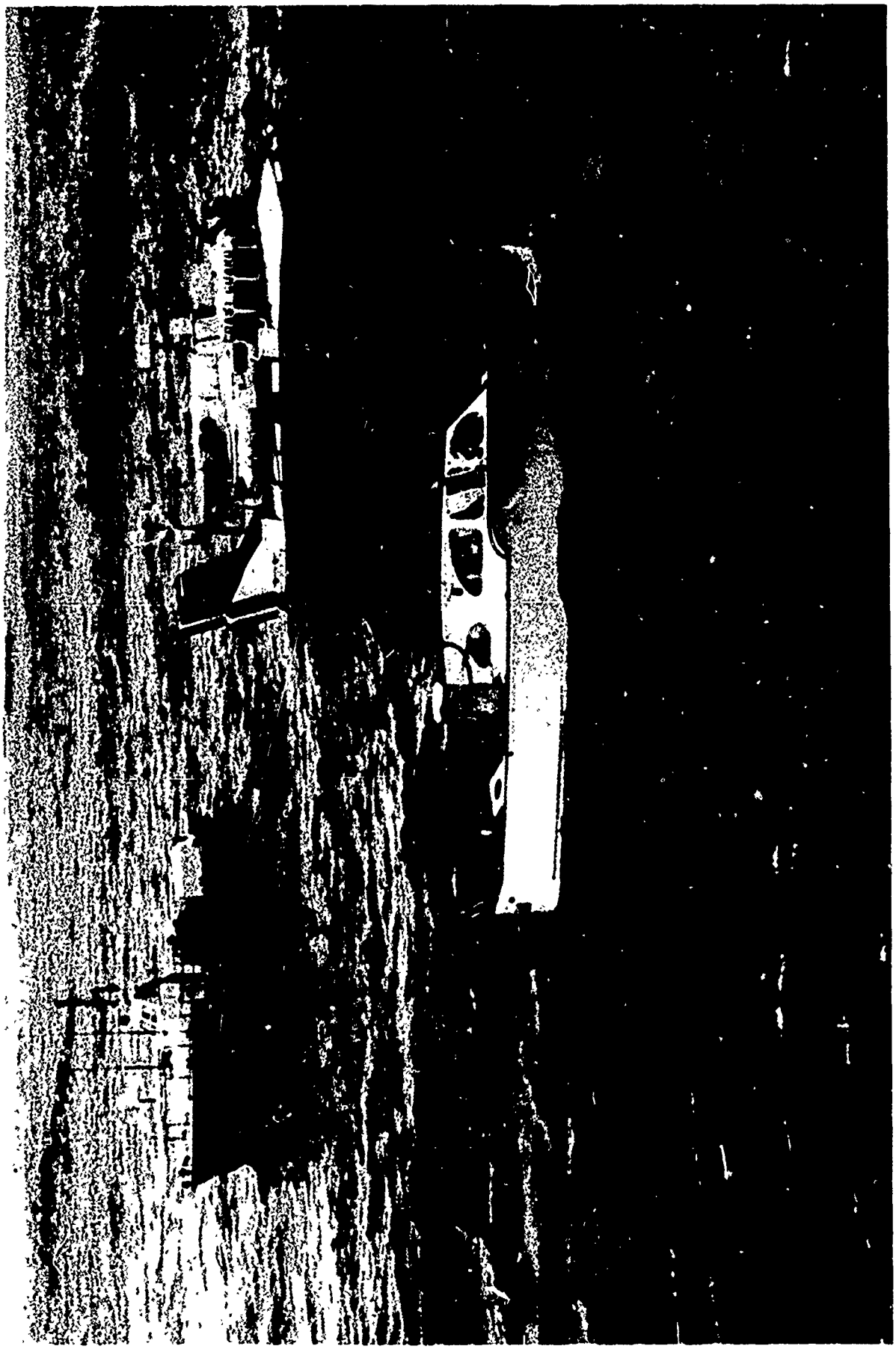

Utilization of MLB/SERV SAR Dual Responce

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ABSTRACT

The United States Coast Guard has conducted an extensive operational study of a combined boat and surface effect rescue vehicle concept of operations. The study was conducted with the use of two CG 44 foot Motor Life Boats (MLB) and two Bell SK-5 Surface Effect Rescue Vehicles (SERV). The primary objective of the study was to develope more extensive and accurate information that would enable a better assesment of the actual value of the SERV in all Coast Guard mission areas, as it compared to other CG surface and air facilities. During this 1 July to 31 December operational study period, both of the MLB's and SERV's were operated from the CG Ft. Point MLB/SERV Unit, San Francisco, California.

During the first six-month phase of the study, the station's operational facilities accumulated 890 hours of operation. The MLB operated 528 hours and the SERV 362 hours. The unit, utilizing a dual responce concept, which provided either an MLB, SERV or both, as the situation dictated, resulted in the unit's participation in 270 Search and Rescue cases. In addition to SAR, the MLB and SERV were effectively used in servicing Aids to Navigation, on law enforcement missions, as well as assisting other agencies of local, state, and federal governments. The unit also participated in a special project, with the use of the SERV, that also involved Oakland International Airport and the Alameda Civil Disaster unit. This project examined the feasibility of using the SERV as an Air Crash Rescue Platform. This first report on the operational study, MLB/SERV Unit 3960-01, documents the first six-months of the studies results, and details the MLB/SERV dual responce operations concept, operation/maintenance cost analysis comparision, MLB/SERV station transition, new ACV developments with possible CG interest, and recommendations and proposals for future SERVs and Boat/SERV dual operations.

The Boat/SERV dual responce concept of operation dramatically demonstrated that it can be a very effective means for solving nearly all of the mission demands that a station of this type and size would normally be confronted with. The operation concept further demonstrated, that this type of operation can be very cost effective, if it is utilized with good discreation.

MLB/SERV OPERATIONAL STUDY REPORT

The Coast Guard has completed the first phase of a one year operational study of a dual Surface Effect Rescue Vehicle (SERV) and a SAR displacement boat concept of operation. The primary goal of the study was to obtain more definitive information that pertained to the SERVs actual CG mission value as it compared with other CG surface and air facilities. During the six-month period under report, two SK-5 SERVs and two 44' Motor Life Boats (MLB) were operated from CG MLB/SEPV unit Fort Point, San Fran. This report documents the results obtained during this six-month PHase I period. A large portion of the actual document amplifies, as well as substanuates data detailed in the two previous Air Cushion Vehicle Evaluation reports, that together documented the initial Coast Guard ACV concept evaluation from 1 January 1971, to 30 June 1972. Both of these reports ACV EU 3960-01 and ACV EU 3960-02 can be obtained from the Defense Documentation Center upon request.

BACKGROUND: In late 1969 three surplus Navy SK-5 Air Cushion Vehicles became available to the Coast Guard. The three crafts were refurbished in 1970 at which time the Coast Guard initiated an expanded ACV evaluation program. During Phase I of the initial evaluation, study was primarly concentrated on examining the ACVs potential for Coast Guard missions in general and the crafts were extensively utilized in the mission areas of search and rescue, aids to navigation, law enforcement, oil polution, and logistics. Another area of Coast Guard ACV utilization during the first phase, involved the operation of one ACV in the Alaskian Artic region in support of the Advance Research Projects Agency's Artic test program. The three ACVs accumulated 1400 hours of operation during Phase One.

Phase II of the initial evaluation program continued to investigate the ACVs potential for various Coast Guard mission applications. During this phase the ACVs were operated in San Francisco, the Northern Great Lakes, and the Chesapeake Bay regions, and accumulated over 800 hours of operation. In late November 1971, shortly after being placed into winter operations in Northern Lake Huron area, the ACV 03 sank as a result of an unexpected chain of events. The craft was later recovered in June 1972, but it was not placed back in operation.

COAST GUARD FORTY-FOUR FOOT MOTOR LIFE BOAT (MLB):

The CG built 44' MLB utilized for this comparision study is a fully tested and approved operational facility of the Coast Guard. The boat itself, was in no way operationally tested during the period under report. It was however, used to provide operational cost data comparisions for use in assesing the SERV's dollar value to various Coast Guard missions.

The MLB's basic characteristics, are briefly described as follows. The MLB is designed and constructed to work under heavy sea and surf conditions. It's 44 foot length and twelve foot eight inch beam welded steel hull is configured in such a way so as to provide the boat with self bailing and self righting characteristics. The MLB in past operations, has proven the boats designed characteristics and on several occasions has completed its missions after sustaining a 180 or 360 degree roll. The boat displaces over 35,000 pounds and has a minimum draft of 3 feet 2 inches. It is powered by two General Motors 6V53 Diesels and turns two 30 inch diameter propellers. The boat has a maximum speed of 14 knots and at full power and a range of 150 nautical miles.

COAST GUARD's SURFACE EFFECTS RESCUE VEHICLE (SERV):

The Coast Guard's SK-5 air cushion vehicle is the same basic design as the SR-N5 developed by British Hovercraft Corporation. It has a length of 38 feet 10 inches, a beam of 23 feet 9 inches and a height of 15 feet 11 inches. The cabin supports a crew of three consisting of the Operator, Radar/Navigator, and SAR Crewman. It can comfortably carry six passengers or an appropriate amount of cargo, in addition to the crew.

The craft has a maximum speed of 70 knots and a range of 300 nautical miles. The SK-5 is powered by a General Electric LM-100 Marine Gas Turbine rated at 1050 shaft horsepower. This is basically the same engine used in the Coast Guard's HH-52 and HH-3F helicopters. A three-bladed, variable pitch propeller provides the required thrust while a seven-foot diameter centrifugal fan supplies the necessary cushion. Both fan and propeller are driven by the single engine.

DUAL OPERATIONAL MLB/SERV STUDY:

At the close of the initial ACV evaluation on 30 June 1972, the Coast Guard decided to continue to operate the two remaining SK-5 ACV's at Coast Guard Station Fort Point, San Francisco, Ca. On 1 July 1972 Coast Guard Station Fort Point was reestablished, by the Commandant, as a fully operational facility of the Coast Guard. The facility includes two SK-5 Surface Effect Rescue Vehicles (SERV) as well as two 44' Motor Life Boats (MLB). Prior to 1 July 1972 the mission of the station was to evaluate the ACV itself, as well as to expose the ACV's concept to government officials and the public in general. As of 1 July 1972 the pure evaluation of the ACV was terminated. However, the ACV evaluation was extended, on a strictly operational level, for an additional one year period. The purposes of the extension was primarily to enable Coast Guard Headquarters to receive and develope more extensive and accurate information as to the ACVs value in all Coast Guard mission areas. The report documents the first six months of this study.

The study itself details the units findings in five general areas, SERV/MLB operations, SERV/MLB cost analysis, new developments in ACV design and componentry, and proposals & recommendations for future SERVs and SERV operations. These five general areas are summed up below.

OPERATIONS MLB/SERV:

Generally speaking, the dual operational concept, utilizing the MLB and the SERV worked out very effectively for search and rescue. However, it was found that good judgement, in the selection of the most appropriate surface facility for any given SAR mission was an essential element in the overall application of this concept. ANNEX A of this report details how effectively this concept was, as well as, how it was applied to the over 260 SAR cases participated in by this unit during the six month period. ANNEX A also discusses and points out the feasibility of using the SERV as a rescue platform for recovery of survivors from downed aircraft in the shallow inassesable water areas that surrounds many of our large airports.

COST ANALYSIS:

Probably no area of the study surprised the personnel of the unit more than the close operational/maintenance costs figures comparision between the MLB and the SERV. The tabulations clearly indicated that SERV and small boat stations can be very cost effective if both types of surface craft are used for their designed characteristics. ANNEX B fully analizes the studies cost data findings.

MLB/SERV UNIT TRANSITION:

The establishment of a unique unit, such as this one, is obviously going to present some unknown difficulties. This unit met these difficulties head on during the first six month phase and for the most part was able to find the necessary solution. Such things as station and ground maintenance requirements coupled with the excessive maintenance demands of the MLB and the SERVs, resulted in placing over burdening demands on the units limited manning structure for the first couple months of operation. This obviously was reflected in the marginal success of the units cross training program. The units transition phase and the problems associated with it are detailed in ANNEX C. Also detailed, are the operations and maintenance instructions, developed during the period, for safe and reliable boat/SERV operations.

AVAILABILITY AND NEW DEVELOPMENTS IN ACV's:

The two Bell SK-5 ACVs currently in use are rapidly approaching the end of feasible utilization. Bearing this in mind, discussion in this report on appropriate replacement craft was felt in order. Obviously, the design of the SK-5 model craft does not meet the requirements necessary to perform Coast Guard missions to the extent

that is desired. The craft was initially designed to carry passengers and was never initially intended to be exploited for their Navy combat role in Viet Nam and the extensive operational use that both craft have received since being with the Coast Guard. The eight years of hard use have left their mark on these two craft.

Since the SK-5 model ACV rolled off the production lines, ACV technology has passed its infancy and a second generation of craft design and componentry has come to pass. Several of the available new developments appear to have merit for Coast Guard application in the SAR and A to N mission area. ANNEX D provides discussion on those new features that appear to have relavent significance.

PROPOSALS AND RECOMMENDATIONS:

The nearly three years of Coast Guard study of the ACV concept of operation, and its feasible application to a varity of Coast Guard missions, has developed a somewhat creditable expertice. The knowledge that has been gained during this and other studies can now be exploited to further the Coast Guards efforts in seeking more effective means and better ways to cope with its ever increasing mission requirements. ANNEX E briefly discusses some desirable changes that would substancially increase the SERVs overall mission effectiveness, when and if this concept is expanded in the Coast Guard. It is obvious that the Air Cushion Vehicle, regardless of its design characteristics, will not replace the use of boats or aircraft in the Coast Guard. Nor will the ACV be suited for operations in all areas where the services has a responcibility. Studies have shown, however, the ACV could, and should play a significant role in the future of the Coast Guard.

MLB/SERV OPERATIONS PROFILE

On 1 July 1972 Coast Guard Station Fort Point became an operational unit of the Coast Guard. The unit's primary mission was to provide surface facilities in support of various Coast Guard missions that occurred within an assigned area of responsibility (Figure A-1). Unlike other Coast Guard units with a similar primary mission, CG Station Fort Point operated and maintained two Bell SK-5 Surface Effect Rescue Vehicles (SERV) and two 44' Motor Life Boats (MLB). The mission objective required that one SERV and one MLB be operationally available on a continuous twenty-four hour, seven days a week basis (B-0 status) primarily for support of search and rescue and secondly for support of other CG missions.

The unit was also assigned a secondary task which was to conduct a one year operational study of a dual response station concept.

Annex A will attempt to document the results of this unique study as it pertained to the unit's operation in general during the period under report. It will also provide brief discussion on the operational uses of both types of surface facilities assigned, along with day to day abstracts of operations for each craft. A description of the MLB or SERV effectiveness for each SAR incident will also be profided.

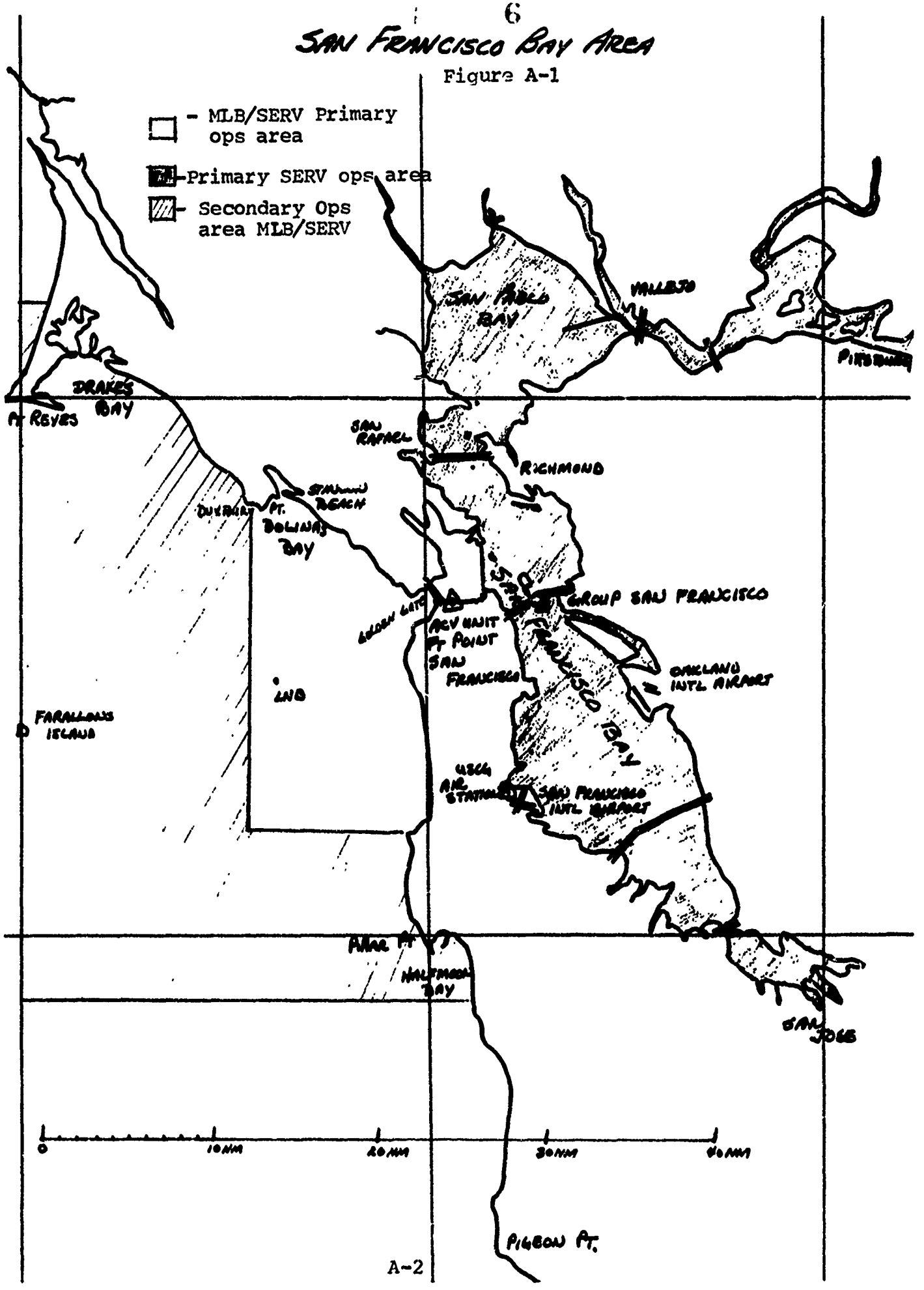
Application of the Dual Response Concept to Search and Rescue: Essentially, the unit's dual response concept provided the all weather capability of the 44' MLB and/or the quick response, fast speed, amphibious characteristics of the SERV. The availability of being able to respond with either or both types of surface units afforded the unit with a very unique SAR response capability. This capability proved to be very effective when discrimently applied.

Upon receipt of notification of a SAR incident, the duty OOD would determine what resource to respond with, as the situation dictated. Two factors were used as the primary aid in determining which type of surface craft was the best suited to the mission at hand. One, the incident's degree of severity, and two, the type of situation and existing weather and sea conditions.

In the event the incident indicated great severity or was questionable at the time of notification, the SERV was dispatched at the fastest possible speed. The SERV's quick response and speed characteristics were obviously effective for satisfying the requirement for this type of SAR incident. The unit's operational records show that a deciding number of past SAR cases fall into this category. However, in most cases, the degree of severity that was indicated at the time of notification was evaluated as being less severe once the first CG unit arrived on scene and was able to assess the actual situation.

SAN FRANCISCO BAY AREA

Figure A-1



In the majority of situations of great severity the availability of the SERV provided the SAR mission coordinator with a reliable means of obtaining a quick assessment of the incident as it existed on scene. Also, the SERV provided a suitable rescue or recovery platform for taking the necessary corrective action. On several occasions, the SERV averaged greater than 50 kts enroute to the scene. Many times the crafts fast speed was considered the primary factor in the overall success of the mission. Obviously with a capability of getting to the scene quickly, the SERV had the advantage of time which in turn altered the effects of the deteriorating elements of the incident and prevented the situation from worsening. More often than not, this resulted in keeping the incident small and usually within the SERV's capabilities to cope with.

Several SAR situations that the SERV participated in involved towing the property out of danger. Although the Bell SK-5 SERV was capable of performing the task, the craft itself had design limitations that made it less desireable than a conventional displacement craft for towing. The major limiting factor was the propeller configuration. As configured on the SK-5 SERV, the propeller prevents the adjustment of the tow after towing has begun unless the craft is shut down. Shutting down the craft in other than ideal conditions cannot always be accomplished without endangering the craft because of the SK-5 fragile hull construction. Another significant factor, with regard to towing, is that the SERV's rate of fuel consumption is much greater than that of an MLB or UTB making it more feasible to use the latter because of the slow speed that towing requires. Therefore, when the SAR incident indicated an obvious towing requirement, the MLB was dispatched. If the same type incident also indicated a great severity, as well as towing, the SERV was dispatched to provide for the immediate towing requirement, such as placing a line on the vessel and towing it out of danger, and was later relieved of the tow by the MLB. It should be borne in mind when reviewing this application of SERV uses for SAR, that many of the limiting factor are inherent with the design of the SK-5 model SERV only. Most of the limitations that concern the SERV hull and propulsion configuration can be easily designed out of future replacement craft. Drawings of a SERV with the desireable features that would make it more suitable for the small CG unit SAR application are shown in Annex D. Annex E provides information on current production models that could accept these desired features with minor modifications to their basic design.

Many of the SAR incidents that confronted the unit, involved searching extensive areas for lost or overdue boats. Usually, and depending upon the location of the search area, the SERV was used more frequently for this type of mission than the MLB. This was especially true if the search area was located in the San Francisco or San Pablo Bays. The SERV, with it's unique amphibious capability could search an entire area from shore to shore. Conversely, an MLB or UTB would be restricted to the deep water area only. Surprisingly, several of the incidents of

of this nature terminated successfully with the overdue boat being located in the shallow areas of the bay and out of the visual range of boats operating in the charted passages. The only other suitable search facilities for conducting searches in these shallow water areas would have been a helicopter or fixed wing aircraft. Shore line searches can also be effectively accomplished with the SERV. Their speed and amphibious qualities obviously makes them especially suited to this type mission. The extent of shallow water area that falls within the reach of the SERV operation out of Fort Point Station is shown if figure A-2. It is easy to see at a first glance that there are several similar waterway configuration existing elsewhere that are also governed by federal maritime statutes.

Brief mention was given to the reach of CG Station Fort Point with the availability of the SERV. Figures A-3 and A-4 further illustrates this posture. The MLB's operation (figure (a-3) were generally restricted to SAR incidents occurring offshore and within the vicinity of the Golden Gate Bridge where the setting was more in line with the boat's sea keeping qualities. On the other hand, the SERV also responded to SAR incidents in the same area as the MLB. However, these situations usually indicaged great severity (figure A-4). Also shown in Figure A-4, is the SERV ability to overlay other Bay Area CG unit's area of responsibility, thus providing an effective backup for the other unit's resources.

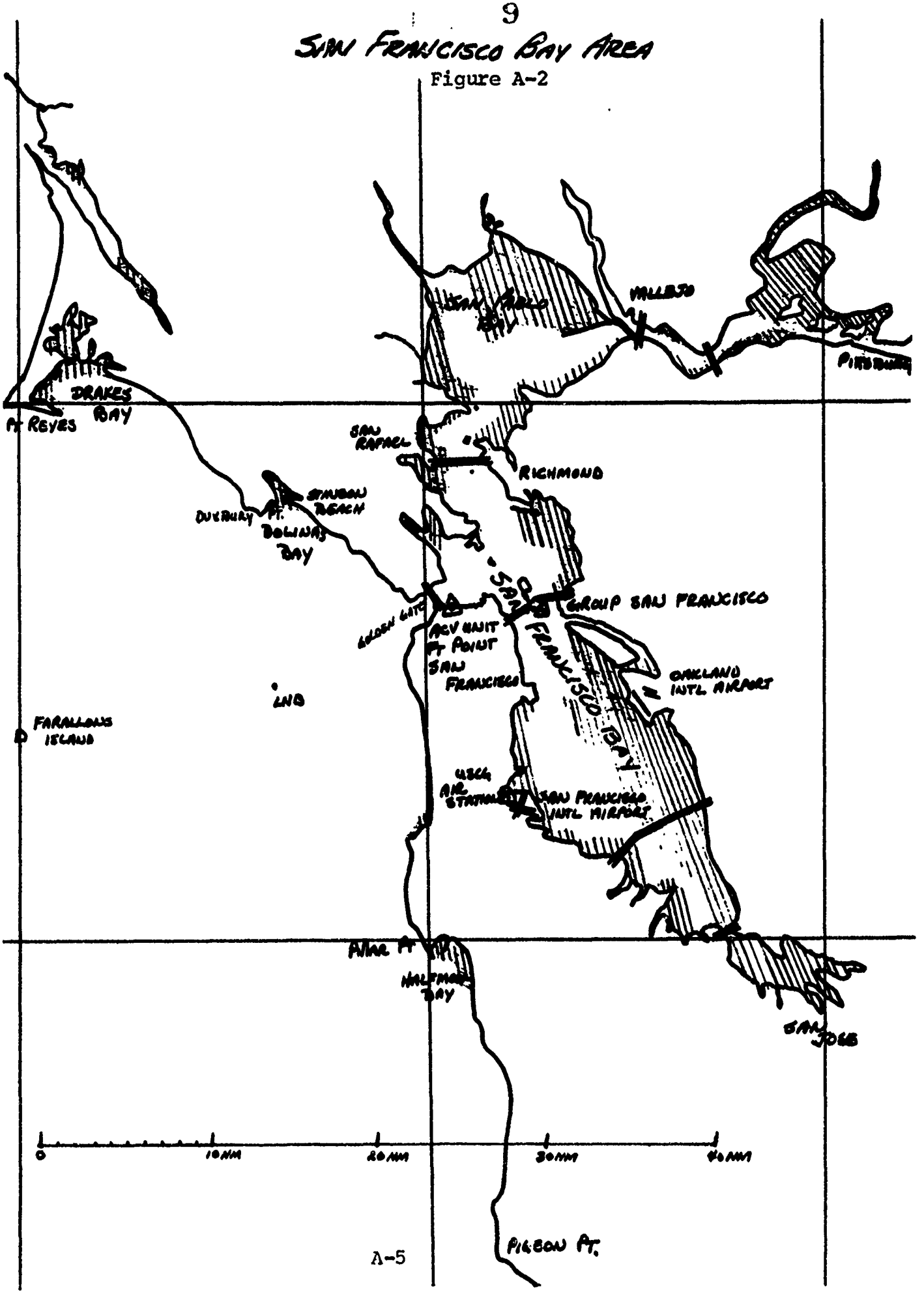
Additional data concerning day to day SAR abstract of operation for the MLB and SERV is provided in Figures A-5 and A-6. In these figures, the operations profile attempts to illustrate the type of mission, which type of unit was used, and the selected unit's effectiveness in carrying out the mission requirements. Additional SAR case data is also included.

In conclusion, during the period under report the MLB participated in 157 SAR missions logging over 240 hours underway time and 1451 nautical miles, total distance traveled. On the other hand the SERV participated in 111 SAR missions logging 174 actual hours of operating time and 3332 n.m. being covered. The MLB averaged 6 n.m. per operating hour and the SERV averaged 19 n.m. per operating hour. The dual SAR response can obviously provide a very effective capability to many types of SAR situations. The unit's six months of recorded operational data contained in the annex proves this to be fact. However, in the application of an operation of this type it is important that the resources be selected discriminently as the situation dictates. This should provide for optimum utilization of each of the craft's special characteristics.

During the period under study the unit was able to provide a ready B-0 SERV for 88.5% of the time with the 11.5% required for unscheduled maintenance requirements. It must be borne in

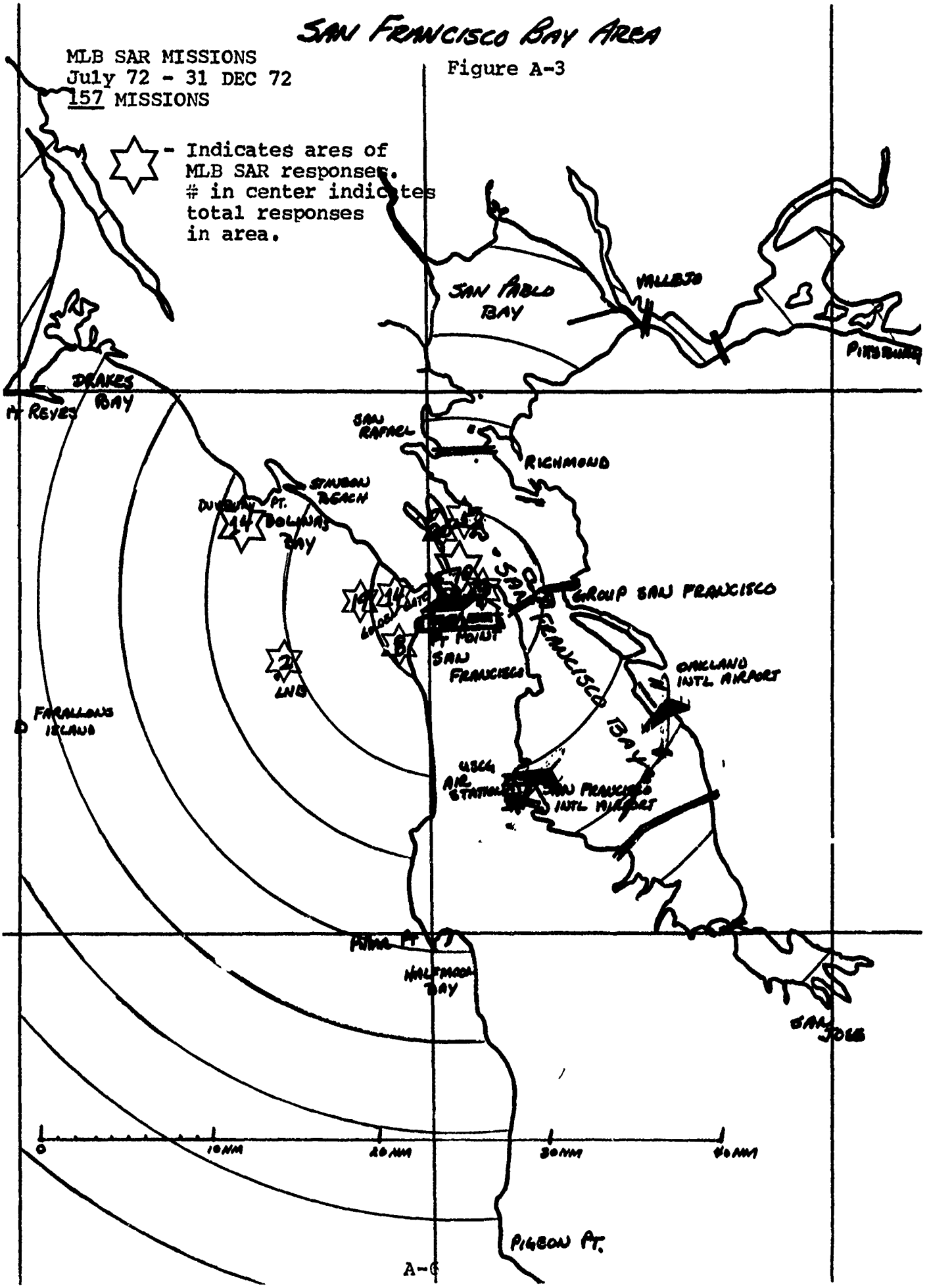
SAN FRANCISCO BAY AREA

Figure A-2



SAN FRANCISCO BAY AREA

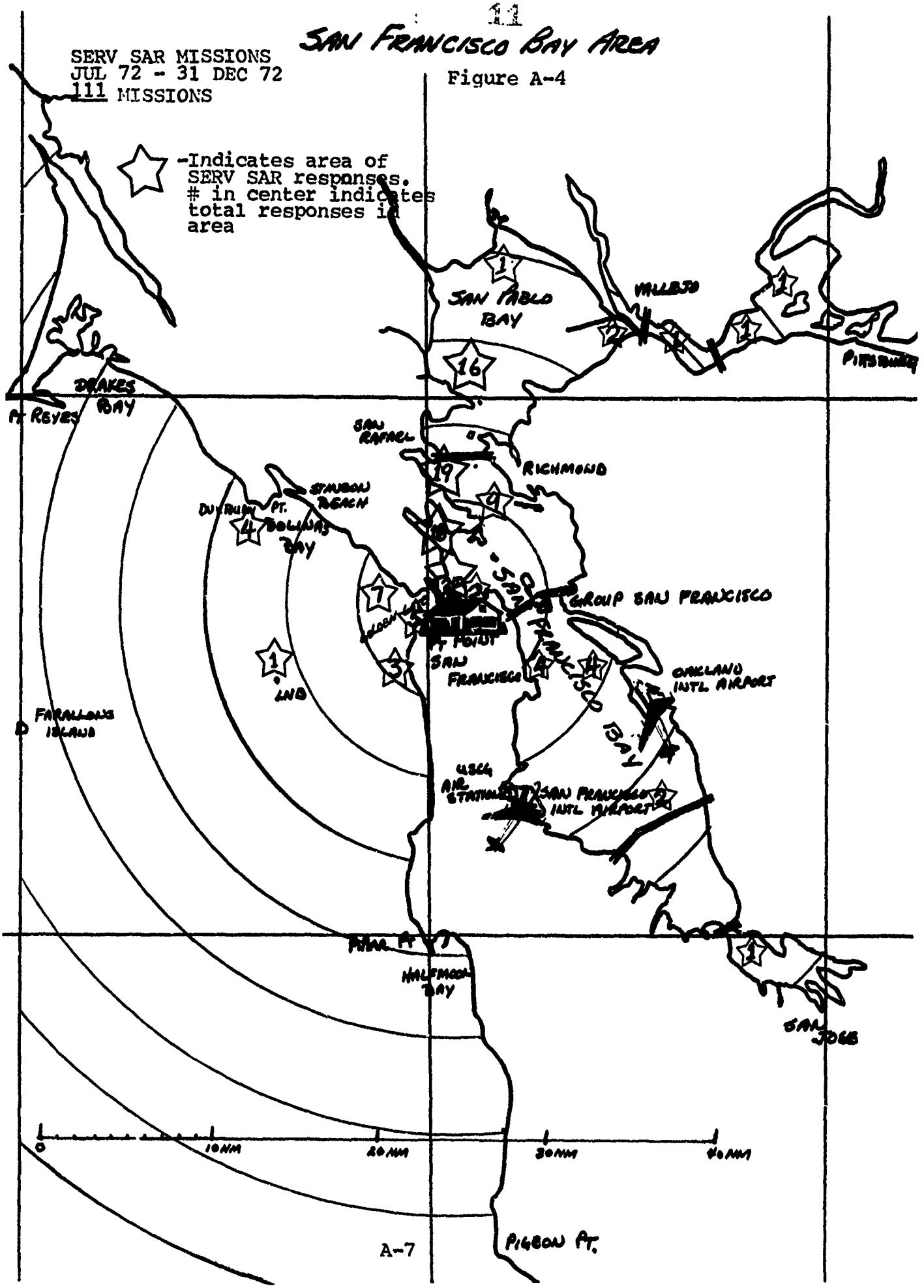
Figure A-3



SAN FRANCISCO BAY AREA

SERV SAR MISSIONS
JUL 72 - 31 DEC 72
111 MISSIONS

Figure A-4



ABSTRACT OF SEARCH AND RESCUE FOR MLB

Figure A-5

Date July	Craft	Mission	U/W hrs	Sorties	Mi.	Type of Incident	Most suitable craft	Helo used	Helo necessary	Helo beneficial	Reason for Choice of craft
1	44347	SAR	.9	1	6	Relief of Tow, G/G Bridge	MLB	No	No	No	Better for Tow
1	47	SAR	1.0	1	8	Relief of Tow, G/G Bridge	MLB	No	No	No	Better for Tow
1	47	SAR	2.3	1	12	House Boat Adrift, Sausalito	MLB	No	No	No	Better for Tow
2	47	SAR	2.6	1	14	C/C engine failure, Bonita Ch.	MLB	No	No	No	Better for Tow
2	47	SAR	1.0	1	7	Rowboat adrift Sausalito	MLB	No	No	No	Better for Tow
3	47	SAR	3.0	1	14	O/B engine failure, Pt. Bonita	MLB	No	No	No	Better for Tow
3	47	SAR	1.7	1	8	C/C engine failure, G/G Bridge	MLB	No	No	No	Better for Tow
4	47	SAR	2.2	1	22	Sailboat Sank, POB on Pilot Boat	MLB	No	No	No	Better for Tow
4	47	SAR	3.3	1	30	O/B engine failure, Duxberry	MLB	No	No	No	Evacuated POB's
4	47	SAR	1.4	1	5	I/B, aground, kirby beach	MLB	No	No	No	Better for Tow
4	47	SAR	4.3	1	16	I/B aground, Sausalito	MLB	No	No	No	Better for two
4	47	SAR	1.9	1	10	S/B fouled prop, Duxberry	MLB	No	No	No	Better for Tow
6	47	SAR	3.2	1	24	C/C engine failure, duxberry	MLB	No	No	No	Better for Tow
7	47	SAR	3.2	1	15	F/V Pt Bonita distress	MLB	No	No	No	Better for Tow
8	47	SAR	1.2	1	11	C/C engine failure, Pt. Bonita	MLB	No	No	No	Better for Tow
8	47	SAR	3.2	1	24	O/B engine failure, Duxberry	MLB	No	No	No	Better for Tow
8	47	SAR	1.9	1	10	F/V lost steering, GG Bridge	MLB	No	No	No	Better for Tow
9	47	SAR	1.9	2	6	S/B capsized, G/G bridge	MLB	Yes	No	No	No ACV righted vsl
10	47	SAR	2.1	1	10	Houseboat adrift, Sausalito	MLB	No	No	No	Better for Tow
11	47	SAR	.3	1	3	S/B adrift, Aquatic Park	MLB	No	No	No	False Alarm
13	47	SAR	2.5	1	12	C/C engine failure Duxberry	MLB	No	No	No	Better for Tow
14	47	SAR	1.3	1	5	F/V engine failure, G/G Bridge	MLB	No	No	No	Better for Tow
14	47	SAR	1.4	1	7	C/c engine failure, Sausalito	MLB	No	No	No	Better for Tow
15	47	SAR	1.8	1	9	C/C engine failure, Pt. Bonita	MLB	No	No	No	Better for Tow
15	47	SAR	1.3	1	10	S/B distress Raccoon Strait	MLB	No	No	No	Better for Tow
16	47	SAR	1.0	1	8	S/B capsized, Sausalito	SERV	No	No	No	Towed & righted
16	47	AR	.8	1	4	F/V engine failure, Pt. Bonita	MLB	No	No	No	Better for Tow
16	47	SAR	.2	1	2	Medivac	SERV	No	No	No	Direc. to use MLB
17	47	SAR	.8	1	4	C/C dead battery Yellow Bluff	MLB	No	No	No	Better for Tow
18	47	SAR	1.0	1	8	Sailboat adrift, Sausalito	MLB	No	No	No	Better for Tow
19	44385	SAR	1.4	1	8	Sailboat anchored Sausalito	MLB	No	No	No	Better for Tow
20	85	SAR	.4	1	8	O/B adrift engine failure, Bonita	MLB	No	No	No	Better for Tow
21	47	SAR	.2	1	1	Raft out of control, Tuburon	MLB	No	No	No	Better for Tow

ABSTRACT OF SEARCH AND RESCUE FOR MLB

Figure A-5

DATE July	Craft	Mission	U/W hrs	Sorties	mi.	Type of Incident	Most suitable craft	Helo used	Helo required	Helo helpful	Reason for Choice of craft
23	47	SAR	1.6	1	8	S/B capsized, Sausalito	SERV	No	No	No	Righted
25	47	SAR	1.4	2	9	O/B, engine failure, Tiburon	MLB	No	No	No	Better for Tow
25	47	SAR	1.3	1	8	Relief of Tow	MLB	No	No	No	Better for Tow
26	47	SAR	.2	1	2	Jumper, G/G Bridge	MLB	No	No	No	Better for recovery
26	47	SAR	4.3	2	30	C/C adrift, Duxberry	MLB	No	No	No	Better for Tow
27	47	SAR	.8	1	8	S/B capsized, Tiburon	SERV	No	No	No	Righted
27	47	SAR	1.1	1	10	Jumper, G/G Bridge	MLB	No	No	No	Better for recovery
28	47	SAR	.4	2	4	Man in Water, Aquatic Park	SERV	No	No	No	Better for recovery
28	47	SAR	2.6	1	8	Man in Water, G/G Bridge	SERV	No	No	No	Better for recovery
29	47	SAR	2.7	1	20	C/C out of gas Buoy 7	MLB	No	No	No	Better for Tow
29	85	SAR	1.9	1	10	Jumper G/G bridge	MLB	No	No	No	Better for recovery
31	85	SAR	3.3	1	30	S/B engine failure, Duxberry	MLB	No	No	No	Better for Tow
			78.6		494						
August											
1	47	SAR	1.2	1	6	C/C disabled, Aquatic Park	MLB	No	No	No	Better for Tow
3	85	SAR	1.0	1	4	C/C engine failure	MLB	No	No	No	Better for Tow
4	47	SAR	1.1	1	8	O/B adrift, Seal Rock	MLB	No	No	No	Better for Tow
6	47	SAR	1.1	1	4	F/V engine failure, Mile Rock	MLB	No	No	No	Better for Tow
6	47	SAR	.3	1	3	S/B dismasted, Baker Beach	MLB	No	No	No	Better for Tow
6	47	SAR	.6	1	1	S/B capsized, Ft. Point	MLB	No	No	No	Better for Wx. cond.
6	47	SAR	.6	1	3	O/B engine failure, Pier 45	MLB	No	No	No	Better for Tow
6	47	SAR	1.7	1	16	Man over, main ship channel	SERV	No	No	No	Better for seas
7	47	SAR	1.6	1	2	S/B adrift Sausalito	MLB	No	No	No	Better for Tow
7	85	SAR	.8	1	6	Medivac, knife wound	SERV	No	No	No	Better for SERV
8	47	SAR	1.9	1	2	S/B adrift Sausalito	MLB	No	No	No	Better for Tow
9	85	SAR	.5	1	9	S/B capsized	SERV	No	No	No	Recommend SERV
10	85	SAR	2.5	1	8	O/B engine failure G/G Bridge	MLB	No	No	No	Better for Tow
10	85	SAR	2.7	1	15	F/V sinking, Pt. Bonita	MLB	Yes	Yes	Yes	Better for fire
12	85	SAR	.5	1	5	S/B capsized Pier 45	SERV	No	No	No	Recommend SERV
13	85	SAR	2.2	2	10	S/B capsized Pt. Bonita	MLB	No	No	No	Better for sea
13	85	SAR	.3	1	1	S/B capsized St. Francis	SERV	No	No	No	Recommend SERV
14	85	SAR	1.9	1	16	F/V sinking Rocky Pt.	MLB	No	No	No	Better for pumping
14	85	SAR	1.7	1	8	O/B engine failure, G/G Bridte	MLB	No	No	No	Better for Tow
14	85	SAR	.9	1	8	S/B capsize, Sausalito	SERV	No	No	No	Recommend SERV
14	85	SAR	.8	1	8	Jumper G/G Bridge	MLB	No	No	No	Better for recovery

ABSTRACT OF SEARCH AND RESCUE FOR MLB

Figure A-5

DATE Aug.	Craft	Mission	U/W hrs	Sorties	mi.	Type of Incident	Most suitable craft	Helo used	Helo required	Helo helpful	Reason for Choice of Craft
15	85	SAR	.2	2	3	MAn in Water, Cliff House	MLB	No	No	No	Better for recovery
16	85	SAR	.2	1	2	Jumper, G/G Bridge	MLB	No	No	No	Better for recovery
17	85	SAR	3.6	2	27	F/V, Duxberry Reef	MLB	No	No	No	Better for Towing
17	85	SAR	1.9	1	15	F/V engine failure, Bouble Pt.	MLB	No	No	No	Better for Towing
17	85	SAR	2.4	1	20	I/B engine failure, Muir Beach	MLB	No	No	No	Better for Towing
18	85	SAR	1.4	1	8	S/B Broken Mast, SAR Buoy	SERV	No	No	No	Recommend SERV
19	85	SAR	.7	1	4	O/B Engine failure, Ft. Pt.	MLB	No	No	No	Better for Tow
19	85	SAR	1.1	1	10	False alarm, Lands End	MLB	No	No	No	Better for sea
22	85	SAR	2. 0	1	16	F/V distress, Muir Beach	MLB	Yes	No	No	Better for tow
22	85	SAR	.4	1	3	Jumper, G/G Bridge	MLB	No	No	No	Better for recovery
22	85	SAR	1.2	1	6	Jumper, G/G Bridge	MLB	No	No	No	Better for recovery
26	85	SAR	1.9	1	18	C/C engine failure Pt. Bonita	MLB	No	No	No	Better for Tow
29	85	SAR	1.5	1	10	Houseboat out of gas, Raccoon St.	MLB	no	No	No	Better for Tow
31	85	SAR	3.3	1	9	F/V engine failure, G/G Bridge	MLB	No	No	No	Better for Tow
			50.2		282						
September											
1	85	SAR	2.2	2	9	S/B aground, Richardson Bay	SERV	No	No	No	Recommend SERV
2	85	SAR	1.3	1	6	C/C aground Alcatraz	MLB	No	No	No	Better for Tow
2	85	SAR	.3	1	2	Jumper, G/G Bridge	MLB	No	No	No	Better for recovery
3	85	SAR	1.5	1	6	C/C engine failure, Pt. Bonita	MLB	No	No	No	Better for Tow
4	85	SAR	3.0	1	27	C/C no gas, Pt. Bonita	MLB	No	No	No	Better for Tow
5	85	SAR	2.2	1	15	F V sinking Treasure Is.	SERV	No	No	No	Recommend SERV
6	85	SAR	4.2	1	21	C/C engine failure 7mi W G/G Br.	MLB	No	No	No	Better for Tow
8	47	SAR	1.9	1	8	Relief of Tow, G/G Bridge	MLB	No	No	No	Better for Tow
8	47	SAR	1.8	1	8	F/V engine failure, Ft. Baker	MLB	No	No	No	Better for Tow
8	47	SAR	.8	1	8	S/B taking on Water Richardson	MLB	No	No	No	Better for pumping
8	47	SAR	.7	1	7	Jumper, G/G Bridge	MLB	No	No	No	Better for recovery
9	85	SAR	1.1	1	4	S/B engine failure, Ft. Mason	MLB	No	No	No	Better for Tow
11	85	SAR	3.2	1	27	C/C engine failure, Stinson Bch	MLB	No	No	No	Better for Tow
12	85	SAR	2.2	1	8	F/V sinking Ft. Point	MLB	No	No	No	Better for Pumping
12	85	SAR	1.8	1	4	Relief of Tow, G/G Bridge	MLB	No	No	No	Better for Tow
15	85	SAR	.8	1	6	C/C taking on water W G/G Br.	MLB	No	No	No	Better for pumping
16	85	SAR	1.2	1	9	C/C engine failure Pt. Bonita	MLB	no	No	No	Better for Tow
17	85	SAR	.7	1	3	Jumper, G/G Bridge	MLB	No	No	No	Better for Recovery
18	85	SAR	1.5	1	4	F/V engine failure, Ft. Point	MLB	no	No	No	Better for Tow

Figure A-5

ABSTRACT OF SEARCH AND RESCUE FOR MLB

DATE Sep/	Craft	Mission	U/W hrs	Sorties	mi.	Type of Incident	Most suitable craft	Helo used	Helo required	Helo helpful	Reason for Choice of craft
20	85	SAR	1.0	1	6	S/B adrift, Aquatic Park	MLB	No	No	No	Better for Tow
20	85	SAR	.6	1	2	S/B capsized, St. Francis	SERV	No	No	No	Recommend SERV
21	85	SAR	1.8	1	8	Relief of Tow, G/G Bridge	MLB	No	No	No	Better for Tow
22	85	SAR	1.5	1	10	F/V engine failure G/G Bridge	MLB	no	No	No	Better for Tow
22	85	SAR	2.8	1	20	S/B sinking, Mile Rock	MLB	No	No	No	Better for pumping
23	85	SAR	1.2	2	7	C/C engine failure, G/G Bridge	MLB	No	No	No	Better for Tow
23	85	SAR	2.7	2	8	Car over cliff, Land's end,	MLB	No	No	No	Better for sea
23	85	SAR	.5	1	3	S/B aground, horshoe cove	MLB	No	No	No	Better for Tow
26	85	SAR	.6	1	5	Jumper, G/G Bridge	MLB	No	No	No	Better for recovery
27	85	SAR	1.4	1	4	Relief of Tow, G/G Bridge	MLB	No	No	No	Better for Tow
27	85	SAR	7.5	1	10	F/V sinking, Alcatraz	MLB	No	No	No	Better for pumping
29	85	SAR	1.5	1	10	Relief of tow, G/G Bridge	MLB	No	No	No	Better for Tow
29	85	SAR	1.5	1	3	C/C no gas, Pt. Bonita	MLB	no	No	No	Better for Tow
30	85	SAR	11.0	1	40	F/V aground, Duxberry	MLB	No	No	No	Better for Tow
30	85	SAR	1.1	1	12	F/V steering failure, Pt. Bonita	MLB	No	No	No	Better for Tow
			159.4		330						
October											
5	85	SAR	1.4	1	6	Relief of Tow, G/G Bridge	MLB	No	No	No	Better for Tow
5	85	SAR	1.8	1	5	C/C sinking, Alcatraz	MLB	Yes	Yes	Yes	Better for pumping
6	85	SAR	1.0	1	8	O/B engine failure, Harding Rock	MLB	No	No	No	Better for Tow
7	85	SAR	1.0	1	10	O/B engine failure, Mile Rock	MLB	No	No	No	Better for Tow
7	85	SAR	.3	1	2	Vsl broaching, G/G channel	MLB	Yes	Yes	Yes	Better for Sea
7	85	SAR	1.9	1	6	Relief of Tow, G/G Bridge	MLB	No	No	No	Better for Tow
8	85	SAR	1.0	1	12	Jumper, G/G Bridge	MLB	No	No	No	Better for recovery
11	85	SAR	1.5	1	8	Relief of Tow, G/G Bridge	MLB	No	No	No	Better for Tow
11	85	SAR	4.2	1	21	C/C engine failure, Playland	MLB	No	No	No	Better for Tow
13	85	SAR	2.7	1	2	C/C engine failure, Ft. Baker	MLB	No	No	No	Better for Tow
14	85	SAR	.5	1	4	POB in surf, Tenn. cove	MLB	Yes	Yes	Yes	Better for Surf
15	85	SAR	.2	1	2	Jumper, G/G Bridge	MLB	No	No	No	Better for recovery
16	85	SAR	1.5	1	4	S/B under pier, Aquatic Park	MLB	No	No	No	Better for Towing
17	85	SAR	1.5	1	4	S/B disabled, G/G Bridge	MLB	No	No	No	Better for Towing
20	85	SAR	.9	1	5	S/B aground, Aquatic Park	MLB	No	No	No	Better for refloat
21	85	SAR	1.0	1	4	O/B engine failure, G/G Bridge	MLB	No	No	No	Better for Tow

ABSTRACT OF SEARCH AND RESCUE FOR MLB

Figure A-5

DATE Oct	Craft	Mission	U/W hrs	Sorties	mi.	Type of Incident	Most suitable craft	Helo used	Helo required	Helo helpful	Reason for Choice of Craft
23	85	SAR	1.8	1	4	S/B becalmed, Mile Rock	MLB	No	No	No	Better for Tow
23	85	SAR	1.2	1	5	Jumper, G/G Bridge	MLB	No	No	No	Better for recovery
28	85	SAR	3.0	1	5	S/B capsized, St. Francis	SERV	No	No	No	Recommend SERV
29	47	SAR	1.2	1	5	C/C engine failure Pt. Bonita	MLB	No	No	No	Better for Tow
29	47	SAR	.7	1	2	S/B capsized, Ft. Point	SERV	No	No	No	Recommend SERV
29	47	SAR	.4	1	3	S/B becalmed, SAR Buoy	MLB	No	No	No	Better for Tow
29	47	SAR	1.3	1	6	S/B becalmed, G/G Bridge	MLB	No	No	No	Better for Tow
30	47	SAR	1.7	1	8	S/B out of Gas, Sausalito	MLB	No	No	No	Better for Tow
			33.5		149						
November											
2	47	SAR	.5	1	2	Jumper, G/G Bridge	MLB	No	No	No	Better for recovery
5	47	SAR	.3	1	2	S/B disabled, Bolinas Bay	MLB	No	No	No	Better for Tow
5	47	SAR	1.5	1	11	I/B engine failure, Sausalito	MLB	No	No	No	Better for Tow
12	47	SAR	1.0	1	8	Flare sighting, Cliff House	SERV	Yes	Yes	Yes	Recommend SERV
16	47	SAR	2.5	1	5	S/B becalmed, Pt. Bonita	MLB	No	No	No	Better for Tow
29	85	SAR	1.7	1	2	Fire, Pier 20	MLB	No	No	No	Better for fire
			7.5		28						
December											
2	85	SAR	2.5	1	10	S/B becalmed	MLB	No	No	No	Better for Tow
4	85	SAR	1.1	1	5	F/V adrift, Pt. Bonita	MLB	No	No	No	Better for Tow
9	85	SAR	1.6	1	5	Relief of Tow, G/G Bridge	MLB	No	No	No	Better for Tow
11	85	SAR	2.1	1	19	F/V dinking, Duxberry	MLB	Yes	Yes	Yes	Better for Pumping
12	85	SAR	.4	1	2	F/V engine failure, Pt. Bonita	MLB	No	No	No	Better for Tow
12	85	SAR	2.9	2	8	F/V sinking, St. Francis	MLB	No	No	No	Better for pumping
16	85	SAR	.4	1	2	Pier, Fire, Pier 20	MLB	No	No	No	Better for fire
19	85	SAR	.8	1	8	Jumper, G/G Bridge	MLB	No	No	No	Better for recovery
			11.3		52						

ABSTRACT OF SEARCH AND RESCUE FOR SERV

Figure A-6

Date July	ACV #	Mission	U/W hrs	Sorties	mi.	Type of Incident	Most suitable craft	Helo used	Helo required	Helo helpful	Reason for Choice of craft
1	02	SAR	.2	1	6	Sailboat Capsized, Berkley	SERV	No	No		Great severity
2	02	SAR	1.1	1	12	C/C, fouled screw, San Rafael	SERV	No	No		No CG assistance Req.
2	02	SAR	1.6	1	30	C/C aground, San Leandro	SERV	No	No		Severity, shallow
3	02	SAR	1.9	1	45	C/C aground, Petaluma River	SERV	No	No		Shallow water
6	02	SAR	4.2	1	35	C/C sinking, Pt. Pinole	SERV	No	No		Great Severity
8	02	SAR	.5	1	4	F/V, no steering, Pt. Bonita	MLB	No	No		Relieved by MLB
9	02	SAR	1.3	1	2	Sailboat capsized, G/G Bridge	SERV	Yes	No	No	Great Severity
10	02	SAR	1.5	1	40	Aircraft Down, San Rafael	SERV	No	No	No	*Great Severity, *False alarm
15	02	SAR	1.2	1	6	Sailboat Dismasted, Pt. Blunt	MLB	No	No	No	Great Severity relieved by MLB
15	02	SAR	.6	1	12	Sailboat capsized, Oakland	SERV	No	No	No	Righted, severity
16	02	SAR	1.4	1	8	Sailboat capsized, Richardson B.	UTB	No	No	No	Great Sv. MLB Assist
16	02	SAR	.6	1	18	Sailboat Capsized, Pt. Pinole	SERV	Yes	Yes	Yes	False Alarm. Sev.
18	02	SAR	.4	1	16	Helo Crash, Suisun Bay	SERV	Unk			Secured Enr. Sev.
19	02	SAR	.7	1	6	O/B sinking, Richardson Bay	SERV	No	No	No	Great Sev. No CG As.
23	02	SAR	.3	1	10	Sailboat Capsized, Strawberry Pt.	SERV	No	No	No.	Great Sev. No CG As.
23	02	SAR	.8	1	8	Sailboat Capsized, Sausalito	MLB	No	No	No	Great Sev. Rel.by MLB
23	02	SAR	.2	1	4	Sailboat Capsized, Sausalito	SERV	No	No	No	Great Sev. No CG as.
25	02	SAR	1.7	1	38	C/C, Engine failure, Richmond	SERV	No	No	No	No CG assistance Req.
25	02	SAR	.4	1	2	I/B, steering failure, Tiburon	MLB	No	No	No	Shallow, Rel. by MLB
25	02	SAR	.9	1	26	Sailboat Capsized, Bolinas Bay	SERV	No	No	No	Shallow, Great Sev.
26	02	SAR	2.1	1	30	C/C adrift, Duxberry	MLB	No	No	No	Lg. area, Rel.by MLB
28	02	SAR	.4	2	4	Man in Water, Aquatic Park	UTB	No	No	No	Shallow, Great Sev.
28	02	SAR	.8	1	16	Sailboat capsized, San Rafael	SERV	Yes	No		Shallow, severity
31	02	SAR	3.1	1	69	C/C aground, Suisun Slough	SERV	No	No		Shallow, severity
TOTAL			27.4		449						

ABSTRACT OF SEARCH AND RESCUE FOR SERV

Figure A-6

Date AUG.	ACV #	Mission	U/W hrs	Sorties	mi.	Type of Incident	Most suitable craft	Helo used	Helo required	Helo helpful	Reason for Choice of Craft
9	02	SAR	3.1	1	50	Sailboat overdue, aground, coyote	SERV	Yes	Yes	Yes	Sev. Shallow water
13	02	SAR	.7	1	25	Sailboat capsized, Stinson Bch.	SERV	No	No	No	Great severity
13	02	SAR	.7	1	25	Sailboat capsized, Pt. Richmond	SERV	No	No	No	Great Sev. POB water
15	02	SAR	.2	1	3	Man in water, Cliff House	MLB	No	No	No	Great Sev. Rocky area
24	02	SAR	.2	1	5	Man in water, Angel Island	SERV	No	No	No	Great Sev. Lg. area
25	02	SAR	1.5	1	40	Sailboat capsized, Berkly marina	SERV	No	No	No	Great Sev. Lg. area
25	02	SAR	1.1	1	15	Sailboat Capsized, Sausalito	SERV	No	No	No	Great Sev. Shallow
27	02	SAR	.6	1	20	Sailboat Capsized, San Quentin	SERV	No	No	No	Great Sev. Shallow
29	02	SAR	.9	1	10	O/B adrift, South Hampton Light	SERV	No	No	No	Large Search area
30	02	SAR	1.1	1	14	O/B aground, Oyster Pt.	SERV	No	No	No	Severity, shallow
31	02	SAR	.8	1	12	S/B capsized, Strawberry Pt.	SERV	No	No	No	Great Sev. shallow
			10.9		219						

ABSTRACT OF SEARCH AND RESCUE FOR SERV

Figure A-6

DATE Sept	ACV #	Mis-sion	U/W hrs	Sor-ties	mi.	Type of Incident	Most suit able craft	Helo used	Helo requ ired	Helo Help ful	Reason for Choice of craft
1	02	SAR	.5	1	22	SAR Boat capsized, Alameda	SERV	No	No	No	Great Sev. shallow
2	02	SAR	.2	1	17	O/B Dead Battery, LNB	SERV	No	No	No	Large search area
4	02	SAR	1.4	1	41	C/C aground, Muir Beach	SERV	No	No	No	Sev. shallow water
4	02	SAR	1.0	2	30	C/C, engine failure, Pier 50	SERV	No	No	No	Diverted, No CG As.
4	02	SAR	.4	1	6	Man in Water, Bay Bridge	SERV	Unk			Great Sev. Lg. area
9	01	SAR	.2	1	3	Personnel Stranded on Beach	SERV	No	No	No	Severity
10	02	SAR	.6	1	8	Woman in water, Cliff House	SERV	Yes	Yes	Yes	Great Sev. Lg. Area
10	02	SAR	.4	1	20	S/B capsized, Richardson Bay	SERV	No	No	No	Great Sev. Shallow
12	02	SAR	.7	1	12	Capsized kyak, Cliff House	SERV	Yes	No		Great Sev. Rocky
13	02	SAR	.3	1	8	Downed Aircraft, SF Internation.	SERV	Unk			Great Sev. Shallow
14	02	SAR	1.5	1	40	S/B overdue, San Rafael	SERV	Unk			Large search area
17	02	SAR	.3	1	5	Jumper, G/G Bridge	SERV	No	No	No	Great Sev. Lg. area
20	02	SAR	1.0	1	7	Rowboat capsized, San Quentin	SERV	No	No	No	Great Sev. Shallow
20	02	SAR	2.5	1	60	Possible boat on fire Degaussin	SERV	No	No	No	Great Sev. faster
20	02	SAR	1.1	1	4	S/B capsized, degaussing buoy	SERV	No	No	No	Great Sev. faster
22	02	SAR	1.0	1	12	S/B taking on water, Mile Rock	SERV	No	No	No	Sev., MLB also escort
23	02	SAR	.6	1	27	I/B, engine failure, Calif City	SERV	No	No	No	Lg. area, UTB towed
23	02	SAR	.2	1	13	Car over cliff, lands end	SERV	No	No	No	Great Sev, rocky
23	02	SAR	.6	1	5	S/B capsized, G/G Bridge	SERV	No	No	No	Great severity
23	02	SAR	.9	1	22	S/B aground, Richardson Bay	SERV	No	No	No	Sev. shallow water
23	01	SAR	1.2	2	16	C/C engine failure, Pt. Bonita	SERV	No	No	No	MLB towed
23	01	SAR	.2	1	3	POB on rocks, Duxberry Reef	SERV	No	No	No	Severity
23	01	SAR	1.2	1	38	Capsize, Pt. Pinole	SERV	No	No	No	Severity, shallow
24	02	SAR	.8	1	12	Personnel stranded, Candlestick	SERV	No	No	No	Secured enroute
24	02	SAR	1.0	1	8	Surfer distress, ocean beach	SERV	No	No	No	Great Sev. Bch area
26	01	SAR	1.2	1	38	S/B capsized, Pt. Pinole	SERV	No	No	No	Sev. No CG assistance
27	02	SAR	1.4	1	10	F/V sinking, alcatraz	SERV	Yes	Yes	Yes	Del. pumps & personel
29	01	SAR	2.5	2	52	F/V aground, Duxberry Reef	SERV	No	No	No	Sev. Delivered pumps
29	01	SAR	.8	1	32	Mine sighting	SERV	No	No	No	Sev. lg. area
30	01	SAR	.5	1	10	S/B capsized, Richardson Bay	SERV	No	no	No	Sev. large area
30	02	SAR	..5	1	2	Skiff adrift, Ft. Pt. museum	SERV	No	No	No	Large search area
			26.9		658						

Figure A-6

ABSTRACT OF SEARCH AND RESCUE FOR SERV

DATE Oct.	ACV #	Mis-sion	U/W hrs	Sor-ties	mi.	Type of Incident	Most suit able craft	Helo used	Helo requ ired	Helo help ful	Reason for Choice of craft
1	02	SAR	.4	1	15	Swimmer distress, aquatic park	SERV	No	No	No	Great sev. faster
2	01	SAR	2.3	1	35	2 POB in water, Tennesee Cove	SERV	No	No	No	Great Sev., rocky
4	01	SAR	.6	1	18	S/B capsized Richardson Bay	SERV	No	No	No	Sev. faster
5	01	SAR	.8	2	10	C/C sinking, Alcatraz	SERV	Yes	Yes	Yes	Del. pumps. & pers.
5	01	SAR	1.8	1	35	C/C, dead battery, berkley	SERV	No	No	No	Large area
7	01	SAR	.2	1	12	O/B, engine failure, Alcatraz	SERV	No	No	No	Towed by Civilian
10	01	SAR	.3	1	8	S/B in rocks, belvedere	SERV	No	No	No	Sev. refloated
11	01	SAR	1.4	1	80	S/B sinking, 3 POB water Hunters Point	SERV	No	No	No	SERV picked up POB UTB towed boat
17	01	SAR	.9	1	20	Medivac, San Rafael Bridge	SERV	No	No	No	Secured enroute
21	01	SAR	.3	1	8	1 POB in water	SERV	No	No	No	severity
21	01	SAR	2.6	1	130	O/B aground San Pablo Bay	SERV	No	No	No	Severity/refloated
21	01	SAR	.1	1	15	CG 30491 aground Oakland	SERV	No	No	No	No CG assistance req
21	01	SAR	1.3	1	36	I/B aground, Marin	SERV	No	No	No	Sev. No Cg. as. req.
22	01	SAR	3.4	1	44	Vessel overdue	SERV	No	No	No	Lg area, MLB towed
23	01	SAR	1.6	1	41	O/B aground, Coret Madera	SERV	No	No	No	Sev. shallow water
23	01	SAR	1.5	1	16	Jumper, San Rafael Bridge	SERV	No	No	No	Sev. lg, area
24	01	SAR	.4	1	5	I/B sinking, Alcatraz	UTB	No	No	No	Severity, towed
24	01	SAR	.1	1	15	POB in water, San Rafael Br.	SERV	No	No	No	Great Sev. lg. area
24	01	SAR	1.7	1	58	I/B aground, Marin	SERV	No	No	No	Sev. shallow water
25	01	SAR	.2	1	6	S/B capsized, POB in water	SERV	No	No	No	Sev. picked POB up
27	01	SAR	3.2	1	50	O/B engine failure	SERV	Yes	Yes	Yes	Lg. area, UTB towed
28	01	SAR	.5	1	8	Raft adrift, Pt. Blunt	SERV	No	No	No	Shallow water
31	01	SAR	.3	2	5	S/B capsized, St. Francis Y/H	UTB	No	No	No	Great Sev. faster
			.1	1	3	O/B engine failure, Racoon Strait	UTB	No	No	No	Lg. area. UTB towed
			25.4		676						

ABSTRACT OF SEARCH AND RESCUE FOR SERV

DATE Nov.	ACV #	Mission	U/W hrs	Sorties	mi.	Figure A-6 Type of Incident	Most suitable craft	Helo used	Helo required	Helo Helpful	Reason for Choice of Craft
1	01	SAR	.3	1	4	Fire, marin island	SERV	Yes	Yes	Yes	No assistance req.
5	01	SAR	1.4	1	35	O/B aground, San Quentin	SERV	No	No	No	Severity, shallow
6	01	SAR	3.1	1	46	S.O.S. flashing Hamilton AFB	SERV	No	No	No	Lg. area, neg results
7	01	SAR	1.5	1	26	I/B Aground San Rafael	SERV	No	No	No	Severity, shallow
10	01	SAR	2.1	1	30	O/B aground Vallejo	SERV	Yes	Yes	Yes	Severity, refloated
11	01	SAR	.9	1	3	S/B capsized St. Francisc	SERV	No	No	No	Severity, righted
12	01	SAR	.5	1	8	Boat disabled, Angel Island	SERV	No	No	No	Lg. search, false al.
12	01	SAR	2.5	1	80	C/ C aground Redwood Cr.	SERV	No	No	No	Severity, shallow
13	01	SAR	2.1	1	69	Duckblind aground 3 POB MARIN	SERV	No	No	No	Severity, shallow
21	01	SAR	1.3	1	35	Flare sighting Buoy #2	SERV	No	No	No	Severity, lg area
22	01	SAR	.3	1	3	Jumper, G/G Bridge	SERV	No	No	No	Great Sev. lg. area
25	01	SAR	2.0	1	50	O/B, Dumbarton Bridge	SERV	No	No	No	Large search area
25	01	SAR	2.2	1	130	O/B capsized Bolinas Bay	SERV	No	No	No	Great severity
25	01	SAR	.9	1	28	S/B aground, Brooks Is.	SERV	No	No	No	Severity, shallow
25	01	SAR	.7	1	8	I/B adrift G/G Bridge	SERV	No	No	No	Towed to Ft. Point
30	01	SAR	1.4	1	38	Jumper San Rafael Bridge	SERV	No	No	No	Great sev. lg. area
30	01	SAR	2.2	1	46	I/B engine failureCarquinez	SERV	No	No	No	Large Search area
			25.4		639						
December											
4	01	SAR	1.0	1	4	Jumper, G/G Bridge	SERV	No	No	No	Great Sev. lg. area
5	01	SAR	2.1	2	30	Sailboat aground, San Pablod Bay	SERV	No	No	No	Sev. No CG assistance
8	01	SAR	3.1	1	20	O/B overdue, Richmond	SERV	No	No	No	Large Search area
17	02	SAR	1.0	1	13	F/V sinking San Rafael Br.	SERV	No	No	No	Sev. No CG assistance
20	02	SAR	2.0	1	40	S/B overdue, San Pablo Bay	SERV	No	No	No	Large Search area
			9.2		107						

mind, however, that during the six months period only one SERV was available for operational use for the entire period because of the extensive hull refurbishment required on both craft (Annex C). With the present availability of both craft, the SERV's ready status should improve substantially. For the same period the unit was also able to provide a ready MLB for 82% of the time with the 18% required for unscheduled maintenance. For 30 days during the month of November the backup MLB was not available at Fort Point due to being transfered to another District MLB unit. During that time, the ready MLB experienced a main engine failure that required a major overhaul. That left the unit without a B-0 MLB for 13 days during which time a UTB from Base San Francisco was transfered to Fort Point Station.

Application of the Dual Response Concept to Aids to Navigation: As with the search and rescue mission concept, the unit's dual response capabilities were effectively applied to the servicing of aids to navigation within the unit's area of responsibility. For the support of the AtoN mission requirements, the unit provided an MLB or SERV as the situation dictated. Normally, the support consisted of providing an MLB or SERV for transportation and a work platform for the specialized AtoN personnel from CG AtoN support units located in the San Francisco area. Both of the major Buoy Tenders utilized the unit's resources frequently for the installation of emergency battery packs on channel buoys. In almost all AtoN servicing missions involving channel buoys the SERV proved to be the more suitable facility. The SERV's speed to and from the buoy was the primary advantage. The MLB proved to be a more effective platform for servicing offshore structures. This was mainly true because of it's ability to back away from the structure in a limited maneuvering area. The SERV was used on one occasion for conducting an AtoN survey of several lighted aids in San Francisco main ship channel from the LNB shoreward and included aids in San Francisco and San Pablo Bays. The inspection called for boarding some of the aids. In the four hour mission the craft traveled 70 miles and successfully carried out all of the mission requirements. During the AtoN survey the SERV's amphibious capabilities permitted the inspection of some channel markers in San Pablo Bay during low tide. This would not have been possible for a displacement craft. Tabs A-1 and A-2 provide AtoN mission data for the six month period of this report and a total operations summary.

The MLB/SERV unit actively supported a community/Public relations program. On numerous occasions briefing and tours were conducted at the Fort Point facility for interested military and civilian groups ranging from Boy Scout Troops and grade school students to a group of senior officers from the Brazilian Naval War College. In addition to the briefing and tours, the unit's SERV participated in an ABC TV series, "The Streets of San Francisco". This participation should produce about ten minutes of Coast Guard exposure on network TV sometime in mid-January 1973.

ANNEX A

Special Operations: One major effort which could be of long term significance was the Air Crash Rescue study conducted with and for the County of Alameda Civil Defense Recovery Unit and Oakland International Airport. The studies objective was to examine the feasibility of using the SERV as a rescue platform for the removal of survivors or bodies from the wreckage of a down aircraft in San Francisco Bay. During the period under report the first phase of this study was completed. The first phase, studied the feasibility of transporting a team of 6 to 8 scuba configured rescue personnel to selected simulated crash sites. The rescue team, was lined up on both sides of the craft cabin (Figure A-7), and were attached to the hand rail with their safety line. Deployment of the team in this fashion proved to be the best and enabled the quick deployment of the team once on scene (Figure A-8). The study showed that the on scene deployment of the entire team could be accomplished in 30 seconds in both shallow and deep water.

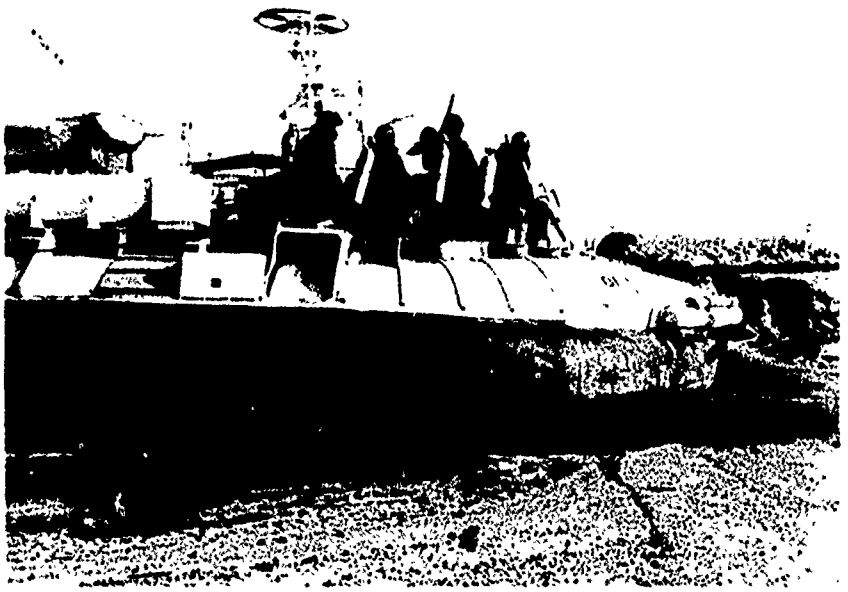
The general consensus of the disaster recovery rescue personnel, with regard to the deployment from a SERV, was very favorable. Additionally, the rescue personnel indicated that the SERV was a much more suitable platform than that of a boat or helicopter, which had been tried in earlier studies. The significant advantage was the ease of deployment and retrieval of rescue personnel (Figure A-9), and the SERV's speed and amphibious capability. Comments concerning the study from the Alameda County Director of Civil Defense are provided in Figure A-10.

At the crash site the rescue plan called for boarding the aircraft wreckage and removing the survivors to suitable life raft that had been delivered to the scene by Helicopters or other means (Figure A-11). The life rafts, loaded with survivors would then be towed or pushed by the SERV to a nearby beach where a temporary mass casualty treatment unit had been set up to receive the survivors. An alternate treatment area could be a large ship anchored in deep water nearby. During Phase two of the study, which is scheduled for mid-January 1973, the feasibility of towing or pushing loaded rubber life rafts to the beach and to large displacement vessels will be studied. However, it should be pointed out that SERV's have successfully towed rubber life rafts to the beach, and no insurmountable problems are anticipated. Overall, the Air Crash Rescue concept appears to be a realistic approach to this type of situation. The ultimate goal of the agencies involved in this study is to develop and implement an emergency plan for an effective air crash rescue capability in the shallow water approaches to Oakland International Airport. Phase Two of the study wil work towards this goal. The basic plan will incorporate the use of U.S. Coast Guard SERV's, the underwater rescue teams of the Alameda County Civil Defense Disaster Recovery Unit, Figure A-12, and Air Crash Rescue Unit of Oakland International Airport. The results of the second phase of the study will be included in this unit's next report, July 1973.

Figure A-7

SERV on the ramp at Oakland International Airport 30 mins. after departure from Ft. Point. Rescue team positioned for deployment

SERV underway enroute simulated crash site



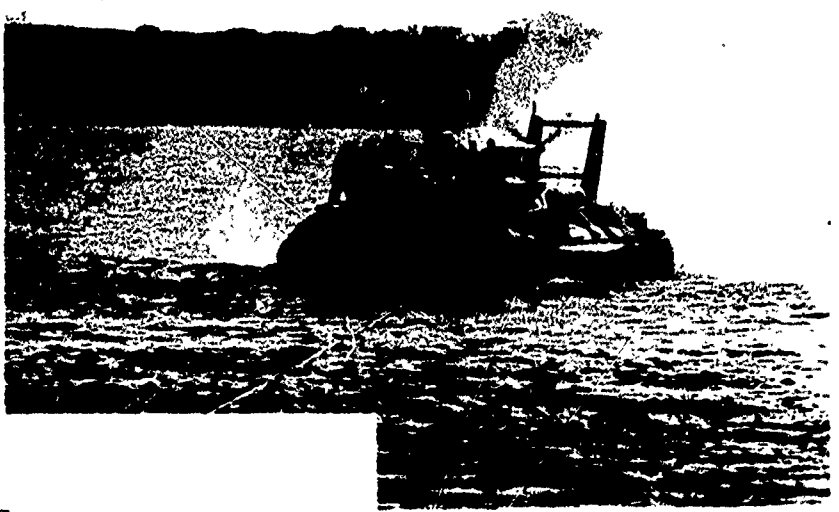
Simulated crash site located at the shallow water approaches to Oakland International Airport.

Figure A-8

25

SERV arriving on scene Simulated crash site Oakland Airport approaches. Water too shallow for displacement craft operation.

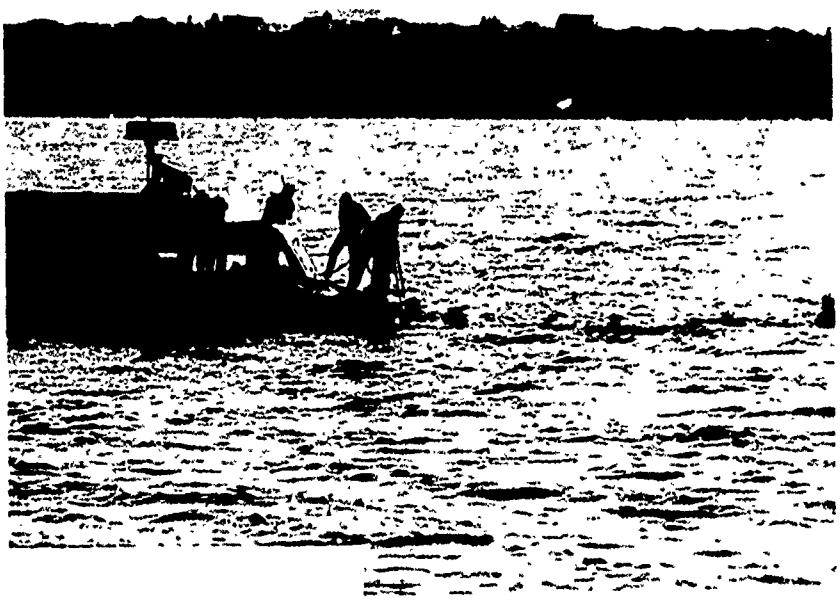
SERV on scene crash site. Rescue team preparing to deploy. Average speed enroute: 30 KTS



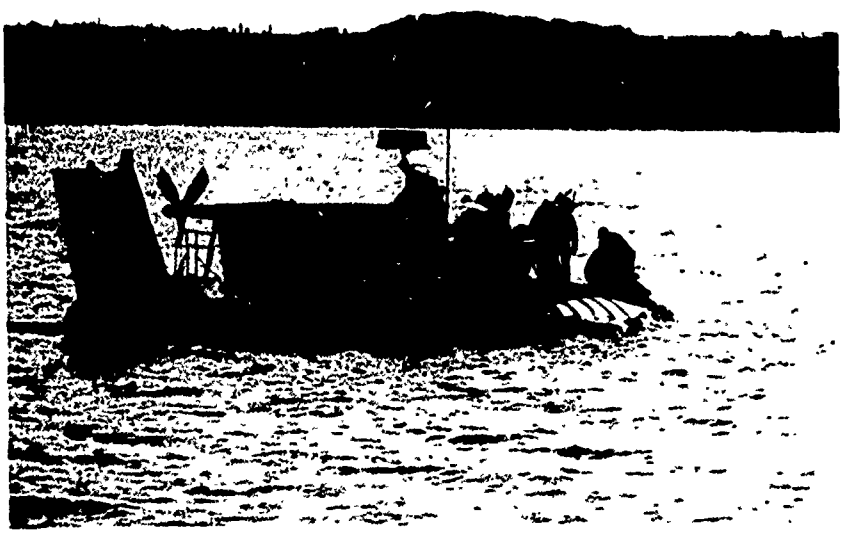
Rescue team departing SERV for simulated survivor rescue. Entire team in the water in 30 Seconds.

Figure A-9

Rescue personnel being assisted aboard with two tenders using a bite of line

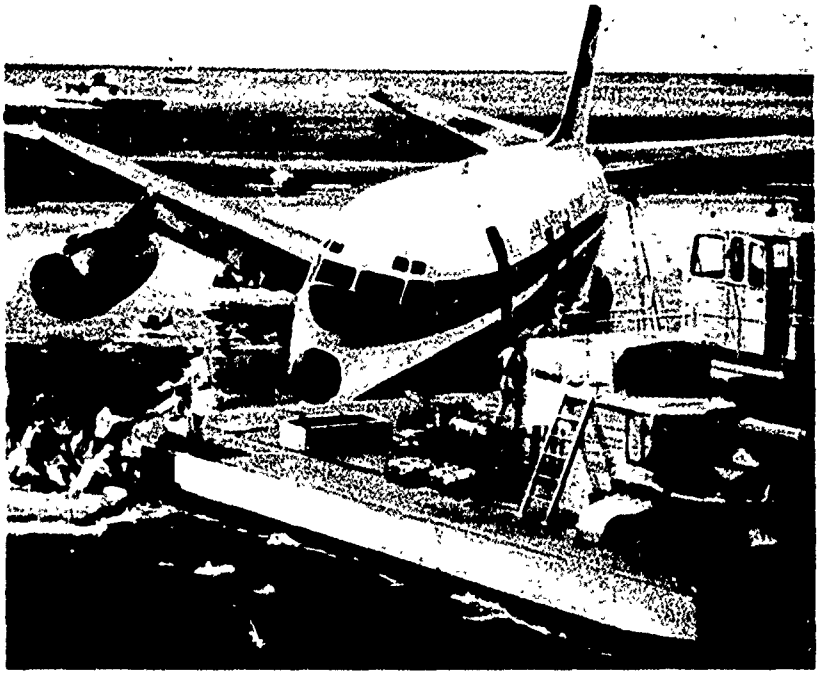


Bite of line placed between scuba tank and back harness. Tenders provide all required lift.



Recovery of all light rescue personnel was accomplished in 6.5 minutes

Figure A-11



Simulated Air Crash rescue in shallow water using rubber life rafts and scuba configured rescue men

Figure A-12

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Disaster Control Office

OFFICES
2700 - 150TH AVE.
276-0600 351-4832
351-8000, EXT. 356

MAILING ADDRESS
P. O. BOX 3247
SAN LEANDRO, CALIFORNIA 94578

UNDERWATER RESCUE INFORMATION

There have been a number of questions asked recently by members of various law enforcement agencies regarding the Alameda County Sheriff's Department Underwater Rescue Units. Questions generally revolve around their capabilities and what procedures should be followed after asking for their services but prior to their arrival. In order to promote a better understanding of this service, the following information is being made available.

Underwater Rescue is a branch of the volunteer services of the Alameda County Sheriff's Department. It consists of two units URU 9 and URU 11; both organized under the Volunteer Services Coordinator at the Alameda County Disaster Control Office. A total of 50 men are actively participating in the program. The units are available to any police and fire department or public agency and have responded to calls from Monterey, Fresno, Lake and Tuolomne Counties as well as those in the Bay Area.

The service has been in existence since 1954. Members are qualified divers and have undergone an intensive training program. They are capable of performing diversified underwater rescue and recovery operations and have been called upon, since inception, to lend a hand in performing widely varied tasks.

In so far as is practicable, agencies requesting URU services should comply with the following requests:

1. Call as soon as possible. This will minimize the drift and settlement problem that must be contended with.

2. Have detailed information regarding the problem available to present to the dive-master upon arrival. The less guessing the dive-master must do, the safer and more efficient the operation.

3. Cease all other rescue operations unless, of course, immediate action may save a life. This insures as much clarity underwater as is possible and allows the divers to see.

   a) Use no grappling hooks.

   b) Use no chains, etc.

4. Where applicable, collect tidal data.

   a) Direction of flow at time of mishap.

   b) Flow, or ebb at time of callout.

   This allows for approximation of depth, current strength, etc.

5. If mishap occurs in river,

   a) Obtain information on current

      1) Multi-directional?

      2) Strength?

6. Give detailed directions to site of operation. When the site is difficult to reach, station an officer in a key position to direct rescue personnel to scene.

Following these guidelines will greatly increase the efficiency of the over-all rescue operation to the benefit and appreciation of all concerned.

Business Telephone Number 276-0600

Emergency Telephone Number 351-2020

Another significant special operation involved the San Francisco Fire Department and the unit's SERV capability. At the request of the Chief of the Department, Figure A-13, a meeting and SERV briefing was set up at Fort Point Station so as to establish the SERV's effectiveness for providing assitance for various fire department emergency tasks. The primary area of concern was that involving cliff rescue operations. During the meeting a SERV demonstration was conducted with high level fire department personnel on board. The demonstration included a simulated SERV cliff rescue assist at the base of a cliff approximately one-half mile west of the Golden Gate Bridge (Figure A-14). Also demonstrated was the SERV ability to land on several beaches in the immediate vicinity of the historical cliff accident area. The meeting was successful in establishing the SERV's effectiveness for this type of operation. Since the meeting the SERV has responded to two cliff accidents that have also involved the S.F. Fire Department.

The first meeting also involved discussion on SERV capabilities for Fire and Rescue assistance. The SERV's amphibious capabilities for use in shallow water cir crash incidents was the primary interest, for obvious reasons.

The unit has received a second request from the Department for another meeting and demonstration(Figure A-15). In response to this request a meeting has been set up for mid-January, 1973.

31 Briefing of Yours Scheduled FOR 0900 23 July.

CITY AND COUNTY OF SAN FRANCISCO
SAN FRANCISCO FIRE DEPARTMENT

OFFICE
CHIEF OF DEPARTMENT
861-8000

260 GOLDEN GATE AVE.
SAN FRANCISCO, CA. 94102

Figure A-13

July 28, 1972

Commanding Officer
Coast Guard Station
Fort Point
San Francisco, Calif.

Dear Sir:

The San Francisco Fire Department is in receipt of a copy of a letter sent to Mayor Alioto by Admiral C. R. Bender, Commandant of the United States Coast Guard. The principal subject of this letter is the commissioning of an operational SERV (Surface Effect Rescue Vehicle) newly stationed at Fort Point.

The Mayor has shown keen interest and forwarded a copy of his letter to this department. We have for many years participated with the Coast Guard in land and sea rescues and body recoveries, therefore we appreciate the Mayor's interest.

A member of our staff communicated with the executive officer of the SERV. This proved to be very informative. Many aspects were noted that could be beneficial to our operations. We would like to know more about your Surface Effect Rescue Vehicle and how we could coordinate our procedures with its capabilities. Primarily, we are concerned with cliff and shore rescues and aircraft fire fighting. If possible, could you send us printed information that would be useful to our units? Perhaps this could institute an exchange of information.

The executive officer of the SERV stated that, with your permission, it may be possible to arrange a demonstration. This would be very enthusiastically looked forward to and potential dates could be discussed by telephone.

I hope arrangements can be made for both of the above requests.

Very sincerely yours,

Keith P. Calden

Keith P. Calden
Chief of Department

Figure A-14

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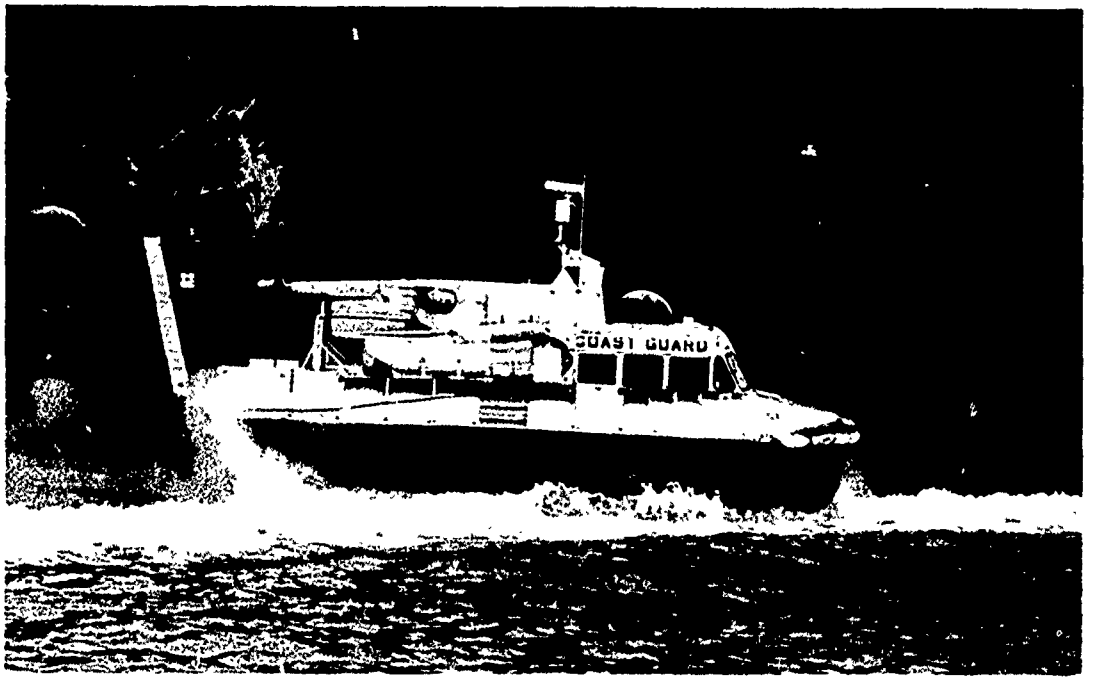
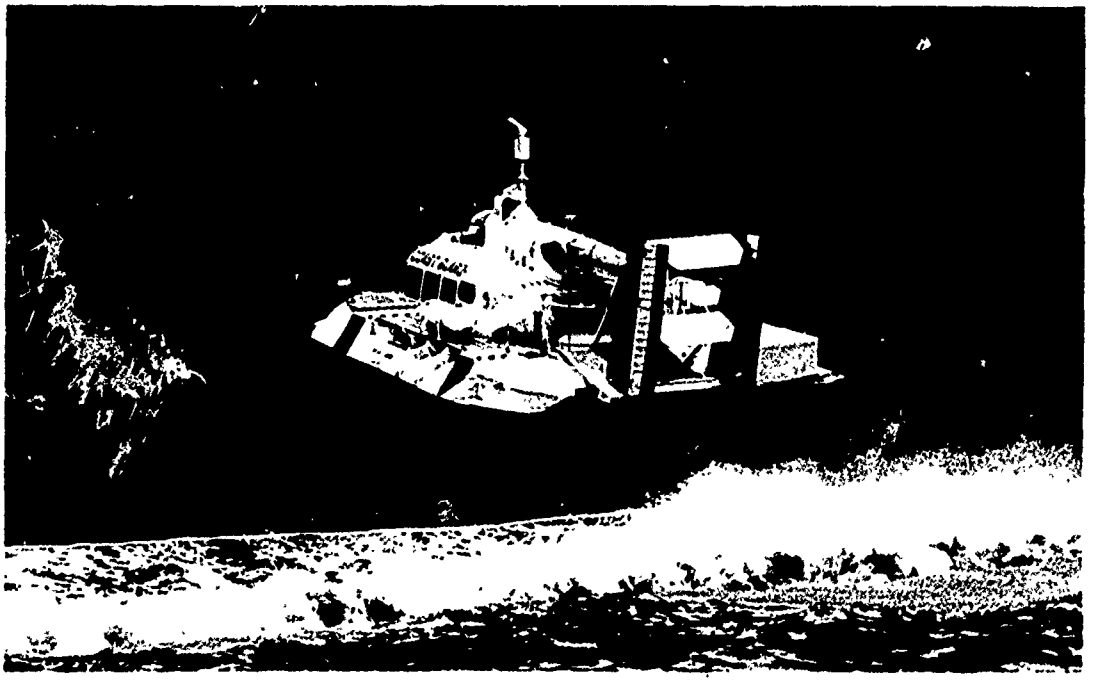
Operational Demo for San Francisco Fire Department Personnel



SERV approaching small beach at the foot of an almost vertical cliff



SERV on the beach, crew simulates recovery of personnel from auto wreckage at the base of the cliff

CITY AND COUNTY OF SAN FRANCISCO
SAN FRANCISCO FIRE DEPARTMENT 33

OFFICE
CHIEF OF DEPARTMENT

260 GOLDEN GATE AVE.
SAN FRANCISCO CA. 94102

Figure A-15

September 12, 1972

Commanding Officer
Coast Guard Station
Fort Point
San Francisco, California

Dear Sir:

On August 23, 1972 myself and six members of my staff were given an enjoyable and informative demonstration aboard your (Surface Effect Rescue Vehicle) SERV.

We cruised the Bay with consideration given to locations where cliff and shore rescues may be made. This was done because we often work in conjunction with the Coast Guard in providing these services.

I am looking forward to the possibility of more of my staff, including my Deputy Chief being given the same demonstration. Last time contact was made for your demonstration with Chief Blair, the Executive Officer of SERV and he was most helpful.

Thank you again for an enjoyable experience and demonstration.

Very truly yours,

Keith P. Calden

Keith P. Calden
Chief of Department

OPERATIONS SUMMARY SHEET

Boat/SERV Number SERV 01 & 02

Tab A-1-A

Month	SAR SR	SAR HR	SAR MI	ATON SR	ATON HR	ATON MI	LAW ENFORCE SR	LAW ENFORCE HR	LAW ENFORCE MI	CO-OP SR	CO-OP HR	CO-OP MI	OP-TRAIN SR	OP-TRAIN HR	OP-TRAIN MI	NPM SR	NPM HR	NPM MI	OTHER SR	OTHER HR	OTHER MI	TOTAL OF HRS	TOTAL OP MILES
JULY	22	40.2	470	3	4.7	70				2	5.2	60	12	19.5	40	4	4.3	70	1	.3	8	74.2	718
AUG	11	10.9	202													2	4.2	105	3	1.6	20	16.7	327
SEP	26	38.5	658	1	7.7	67				5	12.4	300	13	33.5	185	3	4.0	2 0				96.1	1230
OCT	26	33.4	876	7	7.0	20				7	6.5	250	26	16.5	297	5	4.0	122				67.4	1565
NOV	17	35.4	830	4	7.2	161	1	19	.6	1	2.0	86	10	13.8	289	5	6.7	193				67.0	1587
DEC	8	15.6	347	2	3.2	56				1	1.0	8	12	20.8	485	2	1.0	23				41.6	919
SEMI ANNUAL TOTALS	111	174	33-92	17	29.8	374	1	19	.6	17	27.1	704	73	104-.1	12-96	25	26.1	561	4	1.9	28	363.0	6346

OPERATIONS SUMMARY SHEET

Boat/SERV Number MLB 347 & 385

Month	SAR			ATON			LAW ENFORCE			CO-OP			OP-TRAIN			NPM			TOTAL OP HOURS	TOTAL OP MILES
	SR	HR	MI	SR	HR	MI	SR	HR	MI	SR	HR	MI	SR	HR	MI	SR	HR	MI		
JULY	44	71	494	3	8	22										3	5	15	84	531
AUG	38	50	282	9	12	48				3	4	2	1	7	24	1		1	73	363
SEP	36	159	330	27	43	175				4	8	38	22	42	108				252	651
OCT	25	34	149	3	10	62	2	3	10	3	6	20	1	1	4	4	7	74	61	319
NOV	6	8	28	27	18	48				2	2	8	1	1	2	1	1	2	30	88
DEC	8	12	52	5	12	62							3	4	9	1	1	2	29	125
SEMI ANNUAL TOTALS	157	334	1335	74	103	417	2	3	10	12	20	74	28	55	147	10	14	94	529	2077

NOTE: Totals are for the period
1 July 1971 thru 20 December 1972

Figure A-1-B

Shown below is the six month operation summary.

Mission	# of missions	***MLB*** mi	op hrs	# of missions	***SERV*** miles	ophrs
SAR	162	1451	330.0	111	3392	174.0
AtoN	74	417	103.6	17	374	29.8
L.E.	2	10	2.5	1	19	0.6
CO-OP	11	74	20.6	17	704	27.1
NPM	10	94	13.5	25	561	26.1
OP tng	28	147	55.0	73	1296	104.1
	287	2193	528.2	244	6346	361.7

MLB/SERV MAINTENANCE/OPERATIONAL COST ANALYSIS

The task of conducting an operational study of the MLB/SERV dual operation concept also involved the collection of operation and maintenance cost data that would enable a cost comparision between Coast Guard small displacement boats and the Bell SK-5 SERV. The CG 44' MLB displacement craft was used for the actual operational cost study. This annex will attempt to show the operational/maintenance cost comparision of the MLB and the SERV for the first six months of study. During this period the station operated two Bell SK-5 SERV's and two 44' MLB's. The cost analysis that is projected in this annex reflects the direct maintenance and operating costs as well as the man hour requirements for each type of surface craft used in the study. The actual values shown, for each type of craft are averages for both MLB's and SERV's assigned. The total maintenance material cost for both types of craft for the six month period amounted to $9866.59 for the MLB's and $15592.78 for the SERV's. It should be borne in mind, however, that during this period both MLB's underwent programmed semi-annual haulouts at a commercial boat yard facility and the cost for both haulouts is included in the above total. Also included in the MLB maintenance cost data are costs for two unscheduled major engine overhauls. On the other hand, the SERV's maintenance materials total cost figure includes the procurement price for a number one gearbox that failed during normal operations in early December. The replacement cost of the gearbox is estimated at $11000.00. The damaged gearbox's actual condition at the time of installation was unknown. The gearbox was part of the original spare parts received with the SERV's, since the SERV's were over five years old when the CG received them in 1970, it is safe to assume that the gearbox was in other than new condition. The replacement gearbox was also part of the original spare parts stock, and like the damaged gearbox, its actual condition is also unknown, other than the box being tagged in 1970 as ready for installation. This unit does not have the required specialized tool for tearing down a gearbox for inspection.

Obviously, the total cost for the MLB's engine overhauls, as well as the total cost for the SERV number one gearbox failure, have to be computed for actual useage and known cumulative installation life span. Because of lack of historical data on the SERV damaged gearbox, a true computation for establishing a wear percentage factor is not possible. However, previous SK-5 operational studies have established failure rate factors. An analysis extracted from a study based on 5000 hours of SK-5 actual operations is provided in tab B-1-A and B-1-B. In view of the lack of historical data on the SERV's number one gearbox, as well as the non availability of pertinent wear percentage data for the MLB's main engines, the cost for these two items has been omitted from the maintenance cost analysis provided herin.

MAINTENANCE COST ANALYSIS MLB/SERV

The MLB/SERV maintenance cost and man hour requirements for the period under report is broken down into three categories and shown below. The actual day to day maintenance records for the six month period, are shown in tabs B-2 and B-3. The maintenance performed by Base San Francisco Industrial and by commercial boat yard and other facilities was that which was beyond the unit's resources capabilities. The only commercial assistance required for SERV's during this period was for the tuning of the unique comms equipment.

MLB MAINTENANCE COST AND MAN HOUR REQUIREMENTS 1 JUL 72-31 DEC 72
(Excluding two main engine overhaul costs @ $3,101.45)

	Ft Point		Base SFran		Commercial		Totals	
	Cost	M/H	Cost	M/H	Cost	M/H	Cost	M/H
Hull	158.00	373.6	- - -	- -	2043.00	480	2201.00	853.6
Mach.	361.47	109.2	- - -	300	2055.00	480	2416.47	889.2
Elect.	82.81	28.	1489.86	121	575.00	30	2147.67	179.
Routine	- - -	90	- - -	- -	- - -	- -	- - -	90.
Totals	602.28	600.8	1489.86	421	4673.00	990	6765.14	2011.8

SERV MAINTENANCE COST AND MAN HOUR REQUIREMENTS 1 JUL 72-31 DEC 72
(Excluding # one gear box replacement cost @ $11,000.00)

	Ft Point		Base SFran		Commercial		Totals	
	Cost	M/H	Cost	M/H	Cost	MH	Cost	M/H
Hull	125.00	105.6	- - -	- -	- - -	--	125.00	105.6
Mach.	687.50	162.3	- - -	- -	- - -	--	687.50	162.3
Elect.	1310.00	540.2	2117.56	213	342.72	14	3770.28	767.2
Routine	120.00	482.	- - -	- -	- - -	--	120.00	482.
Totals	2242.50	1290.1	2117.56	213	342.72	14	4592.78	1517.3

Maintenance Man Hour Requirements: The average maintenance man hour requirements for the MLB were computed to be 3.8 M/H for each operating hour. The SERV's average maintenance man hour requirements were computed to be 4.2 M/H per hour of operation (Fig. B-1).

Total Maintenance Cost Comparisions shown below are based on total average maintenance cost per O/H, (Fig. B-2).

Average MLB maintenance material cost = $12.81 per O/H

Average MLB maintenance man hour cost = $6.37 per O/H @ $1.67 per hr.*

Total average MLB maintenance cost = $19.18 per O/H

Average SERV maintenance material cost = $12.65 per O/H

Average SERV maintenance man hour cost = $7.22 per O/H @ $1.67 per hr.*

Total average SERV maintenance cost = $19.87 per O/H

OPERATING COST ANALYSIS MLB/SERV

The average direct operating cost per O/H for each type of craft shown below are based on fuel consumption/fuel cost, (Fig. B-3), and the average hourly wage of the three man crew required for both craft.

MLB Operating Cost:

Average fuel cost per O/H = 7.3 gal # 1 dei. @ .15 = $1.10

Average crew cost per O/H = 3 M/H @ 1.67* = $5.01

Total average operating cost = $6.11 per O/H

SERV Operating Cost:

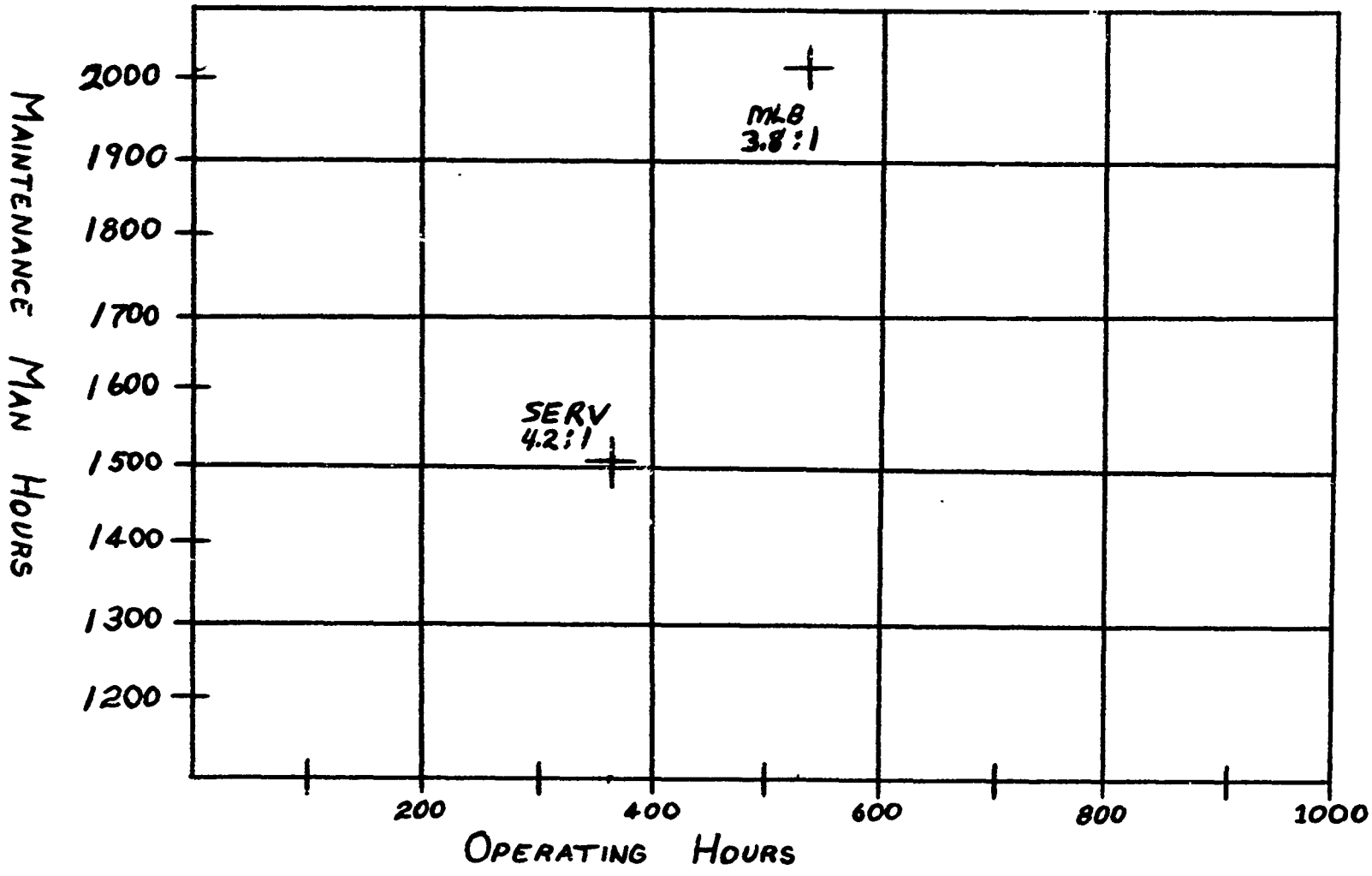
Average fuel cost per O/H = 41 gals J -4 @ .15 = $6.15

Average crew cost per O/H = 3 M/H @ 1.67* = $5.01

Total average operating cost = $11.16 per O/H

* Maintenance Operations Personnel Cost: To determine the average cost for each man hour, an average hourly pay rate was determined by combining the base wage of all the enlisted billets assigned. The average hourly cost per man hour was computed to be $1.67 per hour.

MAINTENANCE MAN HOURS/OPERATING HOURS
MLB/SERV



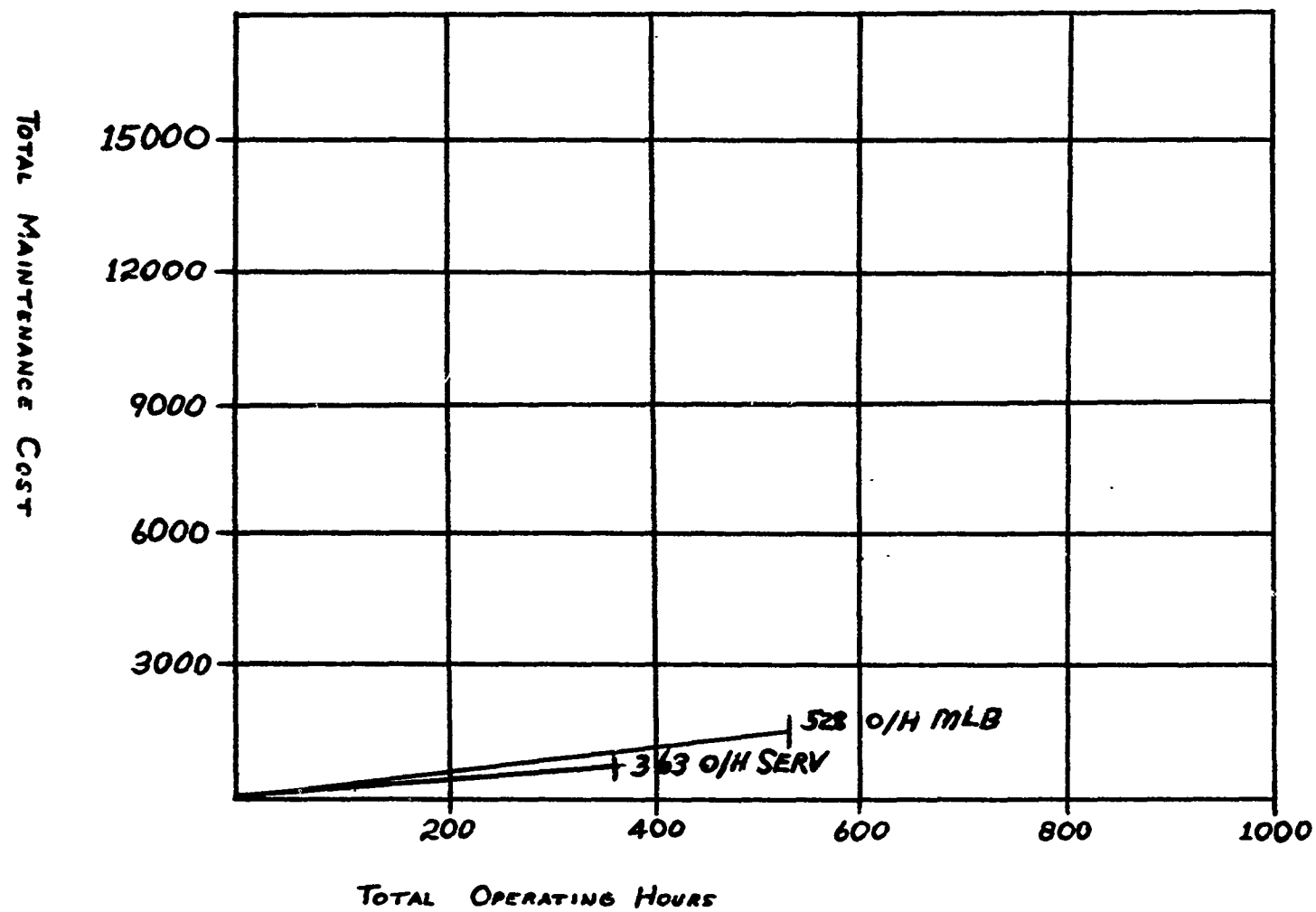
B-4

Figure B-1

TOTAL MAINTENANCE COST / TOTAL OPERATING HOURS

1 JULY 72 - 20 DEC. 72

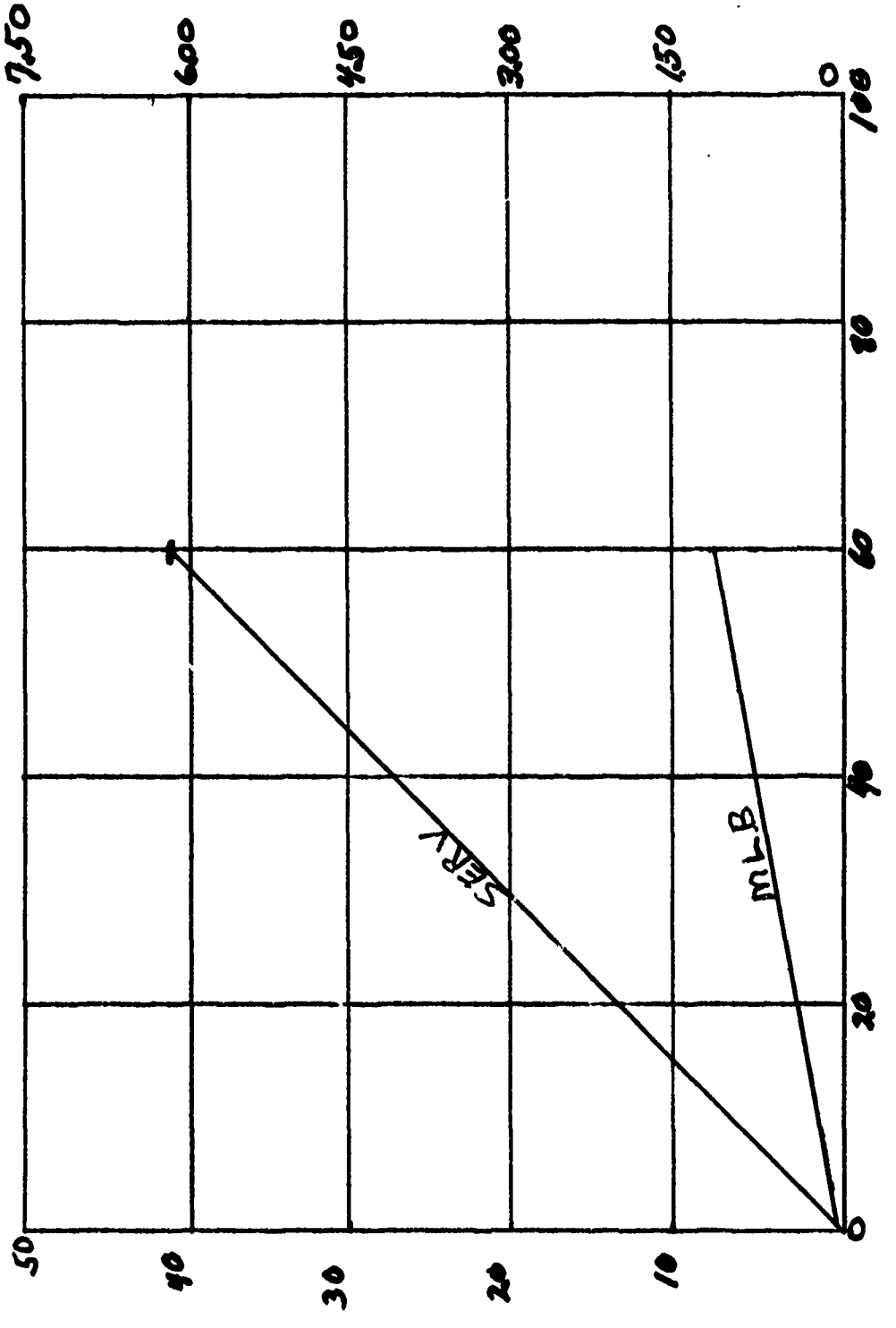
MLB / SERV



B-5

Figure B-2

FUEL COST PER HOUR OF OPERATION
NR. 1 DIESEL AND JP-4 @ .15 per gal



DIRECT OPERATING COST
MLB/SERV

TIME IN MINUTES OF OPERATION

AVERAGE RATE OF HOURLY FUEL
CONSUMPTION IN GALLONS

Figure B-3

Combined Maintenance and Operating Cost Analysis MLB/SERV

MLB total average cost per O/H:

Total average maintenance cost per O/H = $19.18

Total average operating cost per O/H = $ 6.18

Computed average total cost per O/H = $25.36

SERV total average cost per O/H:

Total average maintenance cost per O/H = $19.87

Total average operating cost per O/H = $11.16

Computed average total cost per O/H = $31.03

Cost per mission mile MLB/SERV.

The cost per mission mile that is shown below was calculated from each of the crafts averaged miles per hour accomplishments and total average cost per O/H (Fig. B-4).

MLB average cost per mission mile:

Average maint/ops cost per O/H = $25.36

Average miles per O/H (2077 total miles ÷ 528 total O/H = 3.94 MPH) = 4 MPH

Computed average cost per mile ($25.36 cost per O/H ÷ 4MPH = $6.34 per mile) = $ 6.34 per mile

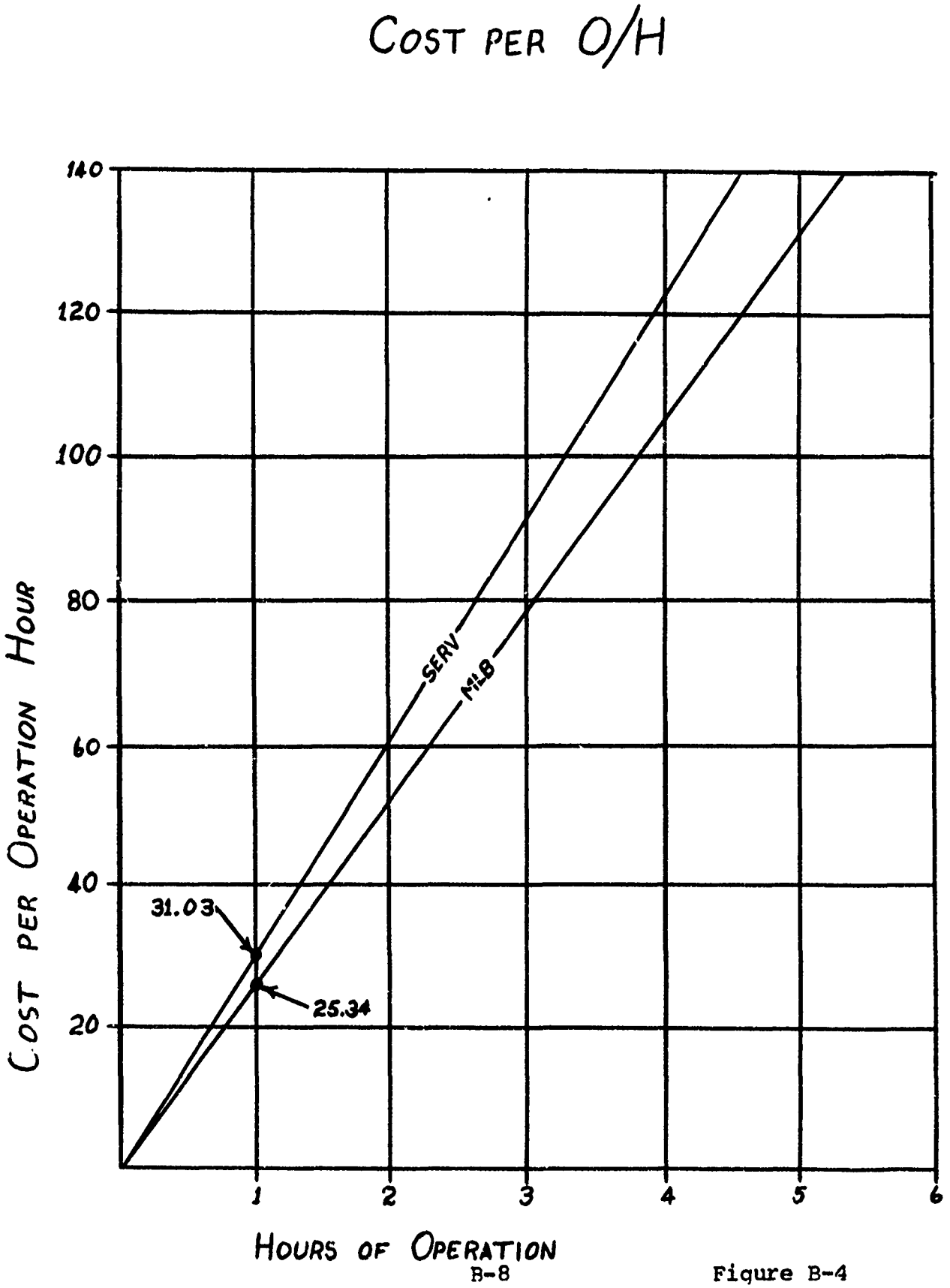
SERV average cost per mission mile:

Average maint/ops cost per O/H = $31.03

Average miles per O/H (6346 total miles ÷ 363 total O/H = 17.39 MPH) = 17 MPH

Computed average cost per mile ($31.03 cost per O/H ÷ 17MPH = $1.82 per mile) = $ 1.82 per mile

In conslusion, it is felt that the Small Boat/SERV dual responce concept can be a very effective tool for handling many Coast Guard missions, ANNEX A. Perhaps the most significant point of interest that is shown in this study is that the SERV can be cost effective when used discrimently. Obviously, with the availability of newer SERV's, with less sophisticated propulsion systems and more desirable hull configuration a more impressive showing could have been realized. Considering the somewhat advanced stage of ACV development in the U.S. within the past few years, it appears that a SERV platform with the Coast Guard's desired configuration and capabilities is now within reach, ANNEX D & E.


COST PER O/H
140
120
100
80
60
40
20
COST PER OPERATION HOUR
SERV
MLB
31.03
25.34
1
2
3
4
5
6
HOURS OF OPERATION

B-8

Figure B-4

System/Subsystem/ Component	λ (Fail./hr)	Unit Cost Each	Overhaul Factor	Repair or Overhaul $
Electrical				
Generating	0.00056	1355	0.25	339
Distribution	0.00100	500	0.10	50
V-A Meter	0.00056	102	-	-
Volt. Reg.	0.00056	370	-	-
	0.00268			
Aux. Power		(1971)		
Engine	0.00036	657	0.25	164
Generator	0.00015	838	0.25	210
Solenoids	0.00056	20	-	-
Exhaust	0.00056	300	-	-
	0.00163			
Instruments				
Not Included Above	0.00140	100	-	-
Hydraulic				
Actuators	0.00140	372	-	-
Δ Pumps	0.00056	2054	0.10	205
Lines and Fittings	0.00078	590	0.10	59
	0.00274			
Transmission				
Δ No. 1 G/B	0.00036	11,500	0.06	690
Δ No. 2 G/B	0.00036	33,000	0.14	4,200
Δ Fan Drive	0.00036	4,000	0.25	1,000
	0.00108			
Oil				
Cooler	0.00036	593	-	-
Storage	0.00036	822	-	-
Δ Pumps	0.00056	153	0.4	61
Lines and Fittings	0.00056	1,000	0.1	100
Indicating				
Temp.	0.00015	50	-	-
Press.	0.00015	50	-	-
	0.00214			

System/Subsystem/ Component	λ (Fail./hr)	Unit Cost Each	Overhaul Factor	Repair or Overhaul Factor
Windshield and Windows				
Windows	0.00036	25		
Glassshield (glass)	0.00036	100	-	-
Wiper Motor and arm	0.00015	100	-	-
Wiper Blades	See Remarks	8	-	-
Washers	0.00015	70	-	-
	0.00102			
Structure				
Doors	0.00015			
Main Frame	0.00056			
See Frame	0.00056			$1.40/ hr/craft
Decks	0.00015			
Fittings	0.00015			
Puff Port Doors	0.00015	200	-	-
	0.00172			
Propeller				
Δ Blades	0.00015	13,000	0.31	4,030
Prop Pitch	0.00119	10,000	0.25	2,500
O-Rings	0.00078	5	-	-
	0.00212			
Navigation				
Compass	0.00015	1,900	0.15	285
Radar Az. Stab.	0.00015	4,800	0.15	720
Radar Set	0.00015	4,793	0.15	719
	0.00045			

System/Subsystem/ Component	λ (Fail./hr)	Unit Cost Each	Overhaul Factor	Repair or Overhaul ($)
Engine				
Turbine	0.00056	74,000	-	10,660
Controls	0.00140	11,000	0.25*	2,750
Starter	0.00119	2,300	-	—
Indicating	-			
T-5	0.00078	146	-	-
Gas Gen. rpm	0.00015	220	-	-
Pwr. Tur. rpm	0.00015	220	-	-
	0.00423			
Lift				
Skirts	0.00015	32,902	-	139*
Skirt Lift	0.00078	435	-	-
Fan	0.00036	17,550	0.25	4,375
	0.00129			
Lighting				
Navigation	0.00056	-	-	
Internal	0.00078	-	-	$7.35
External	0.00078	-	-	Each
Searchlite	0.00015	-	-	
	0.00227			
Fuel				
Storage	0.00015	2,479	-	83*
Distribution	0.00056	2,000	0.20	400
Indicating	0.00036	351	-	-
	0.00107			
Fire				
Detection	0.00100	215	-	-
Extinguishing	0.00015	774	-	-
	0.00115			
Air				
Filter	0.00015	1,680	-	-

System/Subsystem/ Component	λ (Fail./hr)	Unit Cost Each	Overhaul Factor	Repair or Overhaul $
Controls				
Cables	0.00015	350		
Rudder	0.00100	5600	0.1	560
Elevator	0.00036	4500	0.1	450
Elev. Motor	0.00015	1050	-	-
	0.00166			

MAINTENANCE COST RECORD

Month JUL 72 47

Boat/SERV Number MLB 347 Quarter _____ Fiscal Year _____

Day	Operating Hours	Maintenance Costs Hull	Mach.	Elect.	Maintenance Man Hours Hull	Mach.	Elect.
1	.5					.5	
2	.5					.5	
3	6.8					.5	
4	15.1					.5	
5	.5					.5	
6	5.6		.37	38.00		1.5	4.0
7	2.5					.5	
8	10.5					.5	
9	2.6					.5	
10	4/6					.5	
11	3/2					.5	
12	1.1					.5	
13	4/7					.5	
14	3.7		2.40			1.3	
15	4.1					.5	
16	2.8		1.00			2.0	
17	2.7					.5	
18	1.5					.5	
19	.5			44.90		.5	4.0
20	.5					.5	
21	1.7					.5	
22	3.3			38.00		.5	4.0
23	4.3					.5	
24	.5		.50			7.2	
25	5.2					.5	
26	5.5		.30			2.0	
27	3.8					.5	
28	3.9					.5	
29	5.6					.5	
30	.5					.5	
31	3.8					.5	
TOTAL	112.1	0	4.57	120.90	0	53.0	12.0

Note:
Fuel consumption for 6 month period both boats = 4770 gal. cost $715.50
Lube oil consumption = 110 gals cost $62.00
Replenish Repair Parts Allowance Costs = $618.23

MAINTENANCE COST RECORD

Month AUG 72 | 48

Boat/SERV Number MLB 347 Quarter _____ Fiscal Year _____

Day	Operating Hours	Maintenance Costs Hull	Mach.	Elect.	Maintenance Man Hours Hull	Mach.	Elect.
1	1.7					.5	
2	.5					.5	
3	.5					.5	
4	1.6					.5	
5	2.5					.5	
6	6.8					.5	
7	10.2					.5	
8							
9						2.0	
10							
11							
12							
13							
14							
15							
16							
617							
18							
19							
20							
21							
22							
23							
24							
25							
26							
27							
28							
29							
30							
31		1.00			4		
TOTAL	36.9	1.00	0	0	4	5.5	0

MAINTENANCE COST RECORD

Month SEP 72 49

Boat/SERV Number MLB 347 Quarter _____ Fiscal Year _____

Day	Operating Hours	Maintenance Costs Hull	Mach.	Elect.	Maintenance Man Hours Hull	Mach.	Elect.
1		1.00			4		
2							
3							
4						2.0	
5		1.00			4	2.5	
6							
7							
8	7.2						2.5
9	.5						
10	.5						
11	1.5	1.00		21.00	4		2.0
12	7.2						
13							
14							
15							
16							
17							
18		1.00			4		
19							
20							
21							
22							
23							
24							
25							
26							
27						1.0	
28		2.00			8		
29							
30							
TOTAL	16.9	6.00	0	21.00	24	5.5	4.5

27 Sept. haulout at commercial boat yard cost $2543.00
25 Sept. overhaul stbd engine Base S.F. Industrial cost $1092.45

MAINTENANCE COST RECORD

Month OCT 72 50

Boat/SERV Number MLB 347 Quarter _____ Fiscal Year _____

Day	Operating Hours	Maintenance Costs Hull	Mach.	Elect.	Maintenance Man Hours Hull	Mach.	Elect.
1							
2							
3							
4					15		
5		1.00			15		
6		2.00			10		
7							
8							1.0
9							
10							
11		2.00			10		
12		4.00			8		
13		2.00			10		
14		2.00			8		
15							
16		6.00			6		
17		4.00		49.98	4		3.0
18							
19		.50			10		
20		2.00			10		
21		10.00			10		
22		19.00			10		
23							
24							
25		2.00			6		
26							
27				647.08	10	0.5	49.0
28						0.5	
29	4.3			.75		0.5	4.0
30	8.7					0.5	
TOTAL	13.0	56.50	0	697.81	146	2.0	57.0

MAINTENANCE COST RECORD

Month NOV 72 51

Boat/SERV Number MLB 347 Quarter _____ Fiscal Year _____

Day	Operating Hours	Maintenance Costs Hull	Mach.	Elect.	Maintenance Man Hours Hull	Mach.	Elect.
1		2.50		1.00	6	.5	
2	3.3	.50	.50		6	4.5	3.4
3					1	.5	
4						.5	
5	5.3		5.00			4.7	.4
6		.50			20	.5	
7						.5	
8	1.6					.5	
9						.5	
10		3.00			10	.5	.4
11						.5	
12	1.7					.5	
13				60.00		.5	.5
14		4.00			8	.5	
15	1.7					.5	
16	4.0	1.00			4	.5	
17						.5	
18						.5	
19						.5	
20		.50			4	.5	
21						.5	
22		2.00			10	.5	
23		2.00			5	.5	
24						.5	
25						.5	
26						.5	
27					8	.5	
28						.5	
29						.5	
30						.5	
31						.5	
TOTAL	13.5	16.00	5.50	61.00	82	15.7	4.7

MAINTENANCE COST RECORD

MONTH DEC 72 52

Boat/SERV No. MLB 347 QUARTER _____ FISCAL YEAR _____

Day	Operating hours	Maintenance Costs			Maintenance Man Hours		
		Hull	Mach.	Elct.	Hull	Mach.	Elect.
1							
2	3.0				4	.5	
3		.50				.5	
4	5.7					.5	
5	3.0					.5	
6		.50			4	.5	
7		1.00				16.0	
8					7	.5	
9	2.1					.5	
10	2.0					.5	
11	6.6					.5	
12	7.6					.5	
13						.5	
14						.5	
15						.5	
16	2.2					.5	
17	2.0					.5	
18	3.6					.5	
19	5.6					.5	
20	2.6					.5	
21						.5	
22	1.0					.5	
23						.5	
24						.5	
25	2.4					.5	
26							
27							
28							
29							
30							
31							
TOTAL K	49.4	2.00	0	0	16	27.5	0

20 Dec. 72 overhaul stbd engine 44347 Base S.F. Industrial cost $2204.00

MAINTENANCE COST RECORD

Month JUL 72

53

Boat/SERV Number MLB 385 Quarter_____ Fiscal Year_____

Day	Operating Hours	Maintenance Costs Hull	Mach.	Elect.	Maintenance Man Hours Hull	Mach.	Elect.
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12		9.00			6		
13		8.00			6		
14							
15							
16							
17		2.00			4		
18	4.0					.5	
19	1.5					.5	
20	.5			137.95		.5	11.5
21							
22							
23							
24	2.0					.5	
25							
26							
27							
28							
29							
30							
TOTAL	8.0	19.00	[illegible]	137.95	16	2	11.5

Haulout in July = $2,130.00

MAINTENANCE COST RECORD

Month AUG 72

54

Boat/SRV Number MLB 385 Quarter _____ Fiscal Year _____

Day	Operating Hours	Maintenance Costs Hull	Mach.	Elect.	Maintenance Man Hours Hull	Mach.	Elect.
1	1.3					.5	
2	2.7					.5	
3	1.0					.5	
4	7.5			38.00			4.0
5	3.0	1.00			6	.5	
6							
7	1.0					.5	
8							
9	1.5						
10	4.5	4.00	10.30		8	.5	
11	2.5					.5	
12	4.0					.5	
13	5.0					.5	
14	5.0					.5	
15	9.0	1.00			4	.5	
16	4.2						
17	8.0					.5	
18	1.0			128.44		.5	8.0
19	1.8					.5	
20	1.5					.5	
21	3.5					.5	
22	4.0					.5	
23	2.5					.5	
24	4.2					.5	
25	1.0					.5	
26	1.9						
27	0.4					.5	
28							
29	2.0					.5	
30	7.0						
31	6.3	3.00			8	.5	
TOTAL	97.3	9.00	10.30	166.44	26	11.5	12.0

MAINTENANCE COST RECORD

Month SEP 72

55

Boat/SERV Number MLB 385 Quarter _____ Fiscal Year _____

Day	Operating Hours	Maintenance Costs Hull	Mach.	Elect.	Maintenance Man Hours Hull	Mach.	Elect.
1	2.7	1.00			4	.5	
2	3.5					.5	
3	2.2					.5	
4	2.8	2.00			8	.5	
5	7.5	1.00	1.00		4	.5	
6	5.7	1.00	27.12		4	.5	
7	2.6					.5	
8	1.8					.5	
9	1.6					.5	
10	.5					.5	.3
11	4.3					.5	
12	5.8	1.00			4	.5	
13	.5					.5	
14	4.6					.5	
15	2.7					.5	
16	1.7					.5	
17	1.7					.5	
18	3.0	2.00			6	.5	
19	7.9					.5	
20	6.0					.5	
21	6.4					2.0	
22	6.8					.5	
23	4.9					.5	
24	.5					.5	
25	1.9					.5	
26	3.1					.5	
27	9.0		104.00			.5	
28	.5			.06		.5	
29	14.5					.5	.5
30	1.6					.5	
TOTAL	118.6	8.00	132.12	.06	30	16.5	.8

19 Sept. unscheduled haulout to change screw and straighten shaft cost $119.00

MAINTENANCE COST RECORD

Month OCT 72

56

Boat/SERV Number MLB 385 Quarter _____ Fiscal Year _____

Day	Operating Hours	Maintenance Costs Hull	Mach.	Elect.	Maintenance Man Hours Hull	Mach.	Elect.
1							
2							
3							
4					15		
5	6.8	1.00			15	.5	
6	3.5	2.00			10	.5	
7	4.9					.5	
8	1.5					.5	1.0
9	.6					.5	
10	6.2 .5					.5	
11	1.6 6.2	2.00			10	.5	
12	4.5 1.6	4.00			8	.5	
13	.5 4.5	2.00			10	.5	
14	2.2 .5	2.00			8	.5	
15	2.0 2.2					.5	
16	2.0	6.00			6	.5	
17	.5	4.00		49.98	4	.5	3.0
18	.5					.5	
19	2.7	.50			10	.5	
20	4.8	2.00			10	.5	
21	1.5					.5	
22	1.5					.5	
23	2.4	10.00			10	.5	
24	2.7	19.00			10	.5	
25	3.4	2.00			6	.5	
26	2.6					.5	
27	1.0			647.08	10	1.0	49.0
28	3.5					.5	
29	5.5			.75		1.0	4.0
30	2.2					.5	
31	.5					.5	
TOTAL	70.0	56.50	0	697.81	146	14.5	57.0

MAINTENANCE COST RECORD

Month MLB 385 for NOV 72

57

Boat/SERV Number MLB 385 Quarter _____ Fiscal Year _____

Day	Operating Hours	Maintenance Costs Hull	Mach.	Elect.	Maintenance Man Hours Hull	Mach.	Elect.
1				1.00			3.4
2							
3							
4							
5							.4
6							
7							
8							
9							
10							.5
11							
12							.5
13				60.			
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							
26							
27							
28							
29	5.5					.5	
30	2.2					.5	
TOTAL	7.7	0	0	61.00	0	1.0	4.7

MAINTENANCE COST RECORD

Month DEC 72

Boat/SERV Number MLB 385 Quarter 53 Fiscal Year

Day	Operating Hours	Maintenance Costs Hull	Mach.	Elect.	Maintenance Man Hours Hull	Mach.	Elect.
1			4.48			2.0	
2	3.0					7.0	
3	.5	.50	149.00		4	.5	
4	5.7					.5	
5	3.0					.5	
6	.5	.50			4	.5	
7	.5					.5	
8	.5	1.00			8	.5	
9	2.12					.5	
10	2.0					.5	
11	3.6					.5	
12	5.8					.5	
13	.5					.5	
14	.5					.5	
15	.5					.5	4.5
16	2.2					.5	3.0
17	2.0					.5	
18	3.6					.5	
19	4.5					.5	
20	2.6					.5	
21	.5					.5	
22	1.0					.5	
23	.5					.5	
24	.5					.5	
25	2.4					.5	
26	.5					.5	
27	.5					.5	
28	.5					.5	
29	.5					.5	
30	.5					.5	
31	.5					.5	
TOTAL	54.5	2.00	153.48	0	16	23.5	7.5

MAINTENANCE COST RECORD

Month JUL 72

59

Boat/SERV Number SERV 02 Quarter _____ Fiscal Year _____

Day	Operating Hours	Maintenance Costs Hull	Mach.	Elect.	Maintenance Man Hours Hull	Mach.	Elect.
1	8.7						
2	2.7						
3	1.9						
4							
5							
6	7.2			2.00	2.5		1.0
7	3.2						
8	1.2						
9	1.3						
10	3.5						
11	2.2	.50			.5		
12	1.4						
13	1.4						
14	1.4						
15	1.8						
16	2.4			.50			.1
17	1.3					1.0	
18	1.2						
19	.7						
20							
21							
22	2.1						.1
23	1.3			.50			.2
24	2.1					.1	
25	4.7						
26	1.9						
27	4.9	7.0			.5		.2
28	1.4			153.90		1.5	15.0
29	2.3						
30	.6						
31	3.7		40.0			60.00	
TOTAL	68.5	7.50	40.0	156.90	3.5	62.6	16.6

Fuel cons mption for both SERV's during six month period = 13,676 gals cost $2,051.40
Lube oil consumption = 95 qts cost $86.45

MAINTENANCE COST RECORD

Month AUG 72

60

Boat/SERV Number SERV 02 Quarter _____ Fiscal Year _____

Day	Operating Hours	Maintenance Costs Hull	Mach.	Elect.	Maintenance Man Hours Hull	Mach.	Elect.
1	1.0						
2							
3							
4							
5							
6	.5						
7							
8	1.0			264.62			24.0
9	3.1	58.0			7.0		XXXX 13.2
10							
11	1.0					.2	14.0
12							
13	1.4						
14						8.0	
15	.2						
16							
17							
18	1.9			5.00		.1	.5
19	.8						
20	3.6						
21							
22							
23	1.8						
24	.5						.3
25	2.5						
26							
27	.6						
28							
29	1.6						
30	3.0						
31	1.4			7.00			1.2
TOTAL	25.9	58.00		276.62	7.2	8.3	53.2

MAINTENANCE COST RECORD

Month SEP 72 64

Boat/SERV Number SERV 02 Quarter _____ Fiscal Year _____

Day	Operating Hours	Maintenance Costs Hull	Mach.	Elect.	Maintenance Man Hours Hull	Mach.	Elect.
1	2.3						
2	,3						
3	1.4						
4	3.4						
5	2.5						
6	2.8						
7	2.7					2.0	
8	4.4			1.10			.6
9							
10	2.1'						
11	2.2						
12	5.2			4.0		.2	19.00
13	.5						
14	3.9			20.00			1.2
15	1.7						.5
16	1.0				.5		
17	.3						
18	1.1						2.0
19	2.5						
20	3.6						
21	5.3						
22	1.0	10.00			1.6		
23	1.7					.5	
24	3.4			.50			0.1
25	2.0						
26							
27	1.4			7.00	.5		5.0
28							
29							
30	.5						
	UNCOMPLETED W.O. TO YBI ERS			1054.00			97.00
TOTAL	59.2	10.00		1,086.60	2.6	2.7	125.4

MAINTENANCE COST RECORD

Month DEC 72 62

Boat/SERV Number SERV 02 *Quarter*_____ *Fiscal Year*_____

Day	OPERATING HOURS	MAINTENANCE COSTS			MAN HOURS MAINTENANCE		
		HULL	MACH.	ELECT.	HULL	MACH	ELECT.
9							24.0
10							72.0
11							43.5
12							72.0
13	.5						72.0
14				380.00			30.5
15	2.8						
16	3.0						
17	1.0						
18	2.9						
19				.30			.3
		15.00			138.0		
TOTAL	10.2	15.00		380.30	138.0		314.3

NOTE: 138.0 Modification Man Hours for installation of Army SK-5 Fuel Cell.
Estimated cost $15.00 for Misc. hardwares
Oct. & Nov. SERV 02 hangared for extinsive hull refurbishment ANNEX C
Routine Maintenance 12.0 M/H

MAINTENANCE COST RECORD

Month *SEP 72*

63

Boat/SERV Number *SERV 01* Quarter _____ Fiscal Year _____

Day	Operating Hours	Maintenance Costs Hull	Mach.	Elect.	Maintenance Man Hours Hull	Mach.	Elect.
1	0.5						
2							
3							6.7
4							
5	0.2			.36			2.0
6							2.0
7							5.0
8	0.6						
9				645.04			65.7
10							
11							
12	3.0		18.00			3.0	
13							
14							0.3
15				17.00			5.0
16				116.00			7.0
17				.94			12.2
18							
19							2.0
20				.94			6.5
21				40.18			6.7
22	0.2			50.00			4.5
23	1.2						
24							
25				20.00			10.0
26	1.2						
27	2.0			2.0			3.0
28	1.3		75.00			1.0	
29	6.6	2.50	25.00		1.0	4.0	
30	0.4						
TOTAL	17.2	2.50	118.00	892.46	1.0	8.0	138.6

MAINTENANCE COST RECORD

Month OCT 72

64

Boat/SERV Number SERV 01 Quarter _____ Fiscal Year _____

Day	Operating Hours	Maintenance Costs Hull	Mach.	Elect.	Maintenance Man Hours Hull	Mach.	Elect.
1	1.3						
2	2.8			110.0			3.5
3							
4	.7						
5	3.1			5.0	.5		.4
6	4.1			6.50			13.2
7	3.3						
8							
9	2.2						
10	1.9	4.0			4.5		
11	1.7						
12	.9						
13							
14							
15							
16	3.3						
17	2.1						
18							
19	1.0			3.0			1.9
20				6.0			2.7
21	7.8				.4		
22	3.7			197.47			15.0
23	4.0						
24	4.3			.76			1.3
25	3.2						
26	3.0		10.0	30.00	0.3	1.0	9.0
27							
28	5.3						
29							
30							
31	2.1				0.3		
	ROUTINE MAINTENANCE					62.0	
TOTAL	61.8	4.0	10.0	358.73	6.0	63.0	47.0

MAINTENANCE COST RECORD

Month NOV 72

65

Boat/SERV Number SERV 01 Quarter _____ Fiscal Year _____

Day	Operating Hours	Maintenance Costs Hull	Mach.	Elect.	Maintenance Man Hours Hull	Mach.	Elect.
1							.2
2				.76			.2
3							
4							
5				.09			4.5
6							
7				.56			.5
8							
9							
10							
11							
12							
13				16.20			.5
14							.2
15				.19			2.8
16		10.50				1.7	
17							
18							.1
19				.20	.5		3.2
20							
21							
22				14.00			18.5
23							
24							
25	35.0	10.00		.09	8.10	1.0	5
26							
27							
28							4
29							
30				.05		1.0	5
	ROUTINE MAINTENANCE					60.0	
TOTAL	63.9	35.00	20.50	32.14	81.5	63.7	32.1

MAINTENANCE COST RECORD

Month DEC 72

66

Boat/SERV Number SERV 01 Quarter _____ Fiscal Year _____

Day	Operating Hours	Maintenance Costs Hull	Mach.	Elect.	Maintenance Man Hours Hull	Mach.	Elect.
1							
2							
3				30.00			10.0
4	1.7			380.00			18.0
5	3.7						.6
6	3.3			80.00			14.0
7							
8	7.3			5.19			1.3
9							
10							
11							
12							
13							
14		8.00			4.0	32.0	
15						12.0	
16							
17							
18						32.0	
19							
20							
			ROUTINE MAINTENANCE			16.0	
TOTAL	16.0	8.00		495.19	4.0	92.0	53.9

15 Dec. replaced damaged number one gear box est cost $11,000.00

RECORD OF ACTUAL MAINTENANCE MLB/SERV

3. MLB 44347

A. Hull

Hull maintenance for six month period, other than the semi-annual haulout, was mostly routine upkeep such as cleaning, preparation and paint, and maintenance of boat outfitting. Quarterly totals of material cost and man hour requirements are shown below.

1st Quarter		2nd Quarter	
Cost	M/H	Cost	M/H
$7.00	28.0	$74.50	244.0

B. Machinery

1.	Replaced light bulbs	Cost:	$2.40
		M/H:	0.2
2.	Replaced light bulbs	Cost:	$1.00
		M/H:	1.0
3.	Adjusted throttle no cost	M/H:	5.0
4.	Added packing to sea suction valve stbd engine	Cost:	.30
		M/H:	1.0
5.	Adjusted power steering regulator no cost	M/H:	2.0
6.	Adjusted RDF no cost	M/H:	2.0
7.	Repaired search light no cost	M/H:	1.5
8.	Replaced fuse and adjusted FM Radio	Cost:	.50
		M/H:	2.0
9.	Replaced alternator belt	Cost:	$5.30
		M/H:	4.0
10.	Set valves no cost	M/H:	16.0
11.	(Maintenance other than routine) Overhaul of stbd engine, Reverse gear exchange (9-25-72)	Cost:	$1092.45
		M/H:	30^.0
12.	Haulout (Alt's $575.00)	Cost:	$2543.00
		M/H:	480.0

TAB B -2

RECORD OF ACTUAL MAINTENANCE MLB/SERV

3. MLB 44347

A. Hull

Hull maintenance for six month period, other than the semi-annual haulout, was mostly routine upkeep such as cleaning, preparation and paint, and maintenance of boat outfitting. Quarterly totals of material cost and man hour requirements are shown below.

1st Quarter		2nd Quarter	
Cost	M/H	Cost	M/H
$7.00	28.0	$74.50	244.0

B. Machinery

1.	Replaced light bulbs	Cost:	$2.40
		M/H:	0.2
2.	Replaced light bulbs	Cost:	$1.00
		M/H:	1.0
3.	Adjusted throttle no cost	M/H:	5.0
4.	Added packing to sea suction valve stbd engine	Cost:	.30
		M/H:	1.0
5.	Adjusted power steering regulator no cost	M/H:	2.0
6.	Adjusted RDF no cost	M/H:	2.0
7.	Repaired search light no cost	M/H:	1.5
8.	Replaced fuse and adjusted FM Radio	Cost:	.50
		M/H:	2.0
9.	Replaced alternator belt	Cost:	$5.30
		M/H:	4.0
10.	Set valves no cost	M/H:	16.0
11.	(Maintenance other than routine) Overhaul of stbd engine, Reverse gear exchange (9-25-72)	Cost:	$1092.45
		M/H:	300.0
12.	Haulout (Alt's $575.00)	Cost:	$2543.00
		M/H:	480.0

13. Overhaul of stbd engine (12-20-72)8 — Cost: $2209.00 M/H: 240.0

14 Morning test running of engine and general check out — Cost: 00 M/H: 45.0

15. General clean up — no cost — M/H: 90.0

C. Electronics

1. Replaced remote speakers w/o #30463-3023-73 — Cost: $49.98 M/H: 3.0

2. Repaired radar on w/o #30463-3028-73 YBI used $87.95 in parts — Cost: $647.08 M/H: 49.0

3. Replaced lamps and repaired mast — Cost: .75 M/H: 4.0

4. Replaced squelch control on remote spkr — Cost: $1.00 M/H: 2.0

5. Repaired radar on w/o #30463-3001-73 — Cost: $44.90 M/H: 4.0

6. Repaired radar on W/o #30463-3000-73 — Cost: $38.00 M/H: 4.0

7. Repaired URC 45 on w/o #30463-3003-73 — Cost: $38.00 M/H: 4.0

D. Electrical

1. Adjust voltage regulator port side — no cost — M/H: 2.5

2. Replaced stbd voltage regulator — Cost: $21.00 M/H: 2.0

3. Replaced alternator — Cost: $60.00 M/H: .5

Total Electronic and Electrical cost for six month period $1268.02

Total Man hours for six month period = 88.2

4. MLB 44385

A, Hull

Hull maintenance for six month period, otber than the semi-annual haulout, was mostly routine upkeep such as cleaning, preparation and paint, and maintenance of boat outfitting. Quarterly totals of material cost and man hour requirements are shown below

1st quarter		2nd quarter	
Cost	M/H	Cost	M/H
$36.00	72.0	$58.50	162.0

B. Machinery

1.	Adjusted fire pump clutch	Cost:	none
		M/H:	2.0
2.	Replaced injectors	Cost:	$147.00
		M/H:	5.5
3.	Changed oil and filters	Cost:	$4.48
		M/H:	2.0
4.	Morning warm up and check out of equip	no cost	M/H: 45.0
5.	General clean up	no cost	M/H: 90.0
6.	Fuel oil expended 4770 gals	Cost:	$715.00
7.	Lube oil expended 220 gals	Cost:	$92.00
8.	Reset throttle linkage	Cost:	none
		M/H:	5.0
9.	Replaced valve cover gaskets	Cost:	$2.25
		M/H:	1.5
10.	(7-6-72) Haulout (Boat Alt's $1435.00)	Cost:	$2130.00
		M/H:	480.0
	Total:	Cost:	$295.90
	Excluding haulout and fuel and lube oil	M/H:	69.0

C & D Electrical and Electronics

1.	Repair Depth Finder & RDF on w/o # 3002-73 $23.95 for parts	Cost:	$137.95
		M/H:	11.5
2.	Repaired KAAR HF/AM w/o #30463--3006-73	Cost:	$ 38.00
		M/H:	4.0
3.	Repaired RDF on w/o #30463-3008-73 $49.00 for parts	Cost	$128.44
		M/H:	8.0
4.	Repaired Radios on w/o #3021-73	Cost:	$79.84
		M/H:	8.0

5.	Repaired Radar on w/o # 30463-3022-73	Cost:	$139.72
		M/H:	14.0
6.	Repaired Guard xcvr on URC 45 on w/o # 30463-3024-73	Cost:	$39.92
		M/H:	4.0
7.	Repaired MR-4 radar on w/o # 30463-3025-72	Cost:	$93.94
		M/H:	8.0
8.	Replaced antenna holder	Cost:	$14.08
		M/H:	3.0
9.	Trouble shooting short on tack no cost	M/H:	4.5
10.	Trouble shooting short on tack no cost	M/H:	3.0
	Total for 6 month period		$671.96
		M/H:	70.3

TAB B-1

RECORD OF ACTUAL MAINTENANCE MLB/SERV

1. SERV 01

A Hull/Machinery

1. 9-12-72 Broken hydraulic line replaced line Cost: $12.50 M/H: 3.0
2. 9-28 OP & R/N wiper Inop replaced wiper are Cost: $3.00 M/H: 1.o
3. 9-28 Replaced Starter Cost: $90.00 M/H: 1.0
4. 9-29 Replaced pump Cost: N/A
5. 10-2 R/N wiper inop replaced wiper arm Cost: $3.00 M/H: .5
6. 10-5 Replaced fan blade on OP fan no cost M/H:.2
7. 10-7 Parts pending on R/N wiper .
8. 10-8 Patched stern bag Cost: $10.00 M/H: 4.5
9. 10-21 Replaced Bridle Cost: $20.00 M/H: .4
10. 10-23 Replaced latch on line box Cost: .90 M/H: 2.0
11. 10-26 Replaced broken seat belts no cost M/H: .3
12 10-26 Replaced right rear skirt life jack Cost: $10.00 M/H: 1.0
13. 10-31 Freed rusty seat belts no cost M/H: .3
14. 11-1 Tightened center windshield wiper no cost M/H: .2
15. 11-2 XMSN Cowling broken on fwd edge Cost: $5.00 M/H: 1.0
16. 11-10 Rear puff port jack replaced Cost: $10.00 .2

17. Replaced bow towing bridle — Cost: $20.00, M/H: 2.0

18 11-25 Repaired left rear foot & leg — Cost: $35.00, M/H: 81.0

19 11-25 Replaced left rear skirt jack seal — Cost: $10.00, M/H: 1.0

20 100 hour check, Engine run down — no cost, M/H: 40.0

Hull and other maintenance performed — no cost, M/H: 7.5

21. 100 hour check, Engine run down — Cost: $40.00, M/H: 40.0

Total cost and man hours for routine maintenance excluding major refurbishment.(Annex C) — Cost: $329.40, M/H: 143.9

B. Electronics

1. 9-19 Repaired VHF XMTR no cost — M/H: 2.0

2. 9-19 Installed KAAR CL 25 HF/AM/SSBradio, Clipper III VHF Radio W/O 30464-3015-73 — Cost: $645.04, M/H: 63.0

3. Replaced resistors in fan motor of Clipper III VHF — Cost: .20, M/H: 10.0

C. Electrical

1. Repairs on nightsun searchlight — no cost, M/H: 6.7

2. Reinstalled searchlight — Cost: .36, M/H: 2.0

3. Modified relay chassis no cost — M/H: 2.0

4. Repaired relay chassis no cost — M/H: 5.0

5. Replaced fan vlade on R/N fan no cost — M/H: .2

6. Replaced engine stop switch no cost — M/H: 2.1

7. Replaced engine starter terminal block — M/H: .6, no cost

8. Removed crydom temp switch no cost — M/H: .3

9.	Replaced port navigation light	Cost:	$17.10
		M/H:	5.0
10.	Replaced fwd range light	Cost	$16.00
		M/H:	3.0
11.	Replaced engine starter	Cost:	$100.00
		M/H:	5.0
12.	Replaced engine control box	M/H:	5.)
13.	Replaced port aux fuel tank wiring	Cost:	.94
		M/H:	7.2
14.	Replaced stbd aux fuel tank wiring	Cost:	.94
		M/H:	6.5
15.	Replaced ballast indicating syste,	cost:	.18
		M/H:	3.2
16.	Replaced center windshield assy	Cost:	$40.00
		M/H:	4.5
17	Replaced rotating beacon	Cost:	$50.00
		M/H:	4.5
18.	Replaced fire element bushings no cost	M/H:	.5
19.	Replaced engine starter	Cost:	$60.00
		M/H:	2.0
20.	Replaced aux transfer pump	Cost:	$100.00
		M/H:	3.0
21.	Replaced OP wiper arm	Cost:	$10.00
		M/H:	.5
22.	Repaired OP overhead fan	Cost:	$5.00
		M/H:	-.2
23.	Repaired radar T/R unit	Cost:	$5.00
		M/H:	12.0
24.	Repaired generator wiring	Cost:	$1.50
		M/H:	1.0
25.	Repaired fire warning system no cost	M/H:	.2
26.	Repaired radar	Cost:	$3.00
		M/H:	1.9
27.	Replaced generator drive belt	Cost:	$6.00
		M/H:	2.7

28. Replaced rotating beacon bulb — Cost: $.76, M/H: .3

29. Complete operational check of gyro compass — M/H: 1.0

30. Replaced generator. — Cost: $30.00, M/H: 9.0

31. Repaired radar — Cost: $197.47, M/H: 15.0

32. Repaired center wiper no cost — M/H: .2

33. Repaired radar — Cost: .09, M/H: 4.5

34. Repaired VHF/FM xcvr — Cost .56, M/H: .5

35. Replaced R/N map light — Cost: $16.20, M/H: .5

36. Repaired radar no cost — M/H: 2.0

37. Repaired R/N wiper — Cost: .19, M/H: .3

38 Repaired 4 wires in main craft wire bundle — Cost: .20, M/H: 3.0

39. Repaired radar — Cost: $14.00, M/H: 16.0

40. Repaired navigation lights — Cost: none, M/H: 2.5

41. Replaced generator — Cost: $30.00, M/H: 10.0

42. Replaced generator and voltage regulator — Cost: $380.00, M/H: 18.0

43. Replaced fire warning elements no cost — M/H: 14.0

Total Cost: $801.06 TOTAL MAN HOURS 123.1

2. SERV 02

A. Hull/Machinery

1. Door warped and glass broken — Cost: $17.90, M/H: 2.5

2. Puff side fender chain broken — Cost: .10 M/H: .5

3. Replaced fender — Cost: $10.00

4. Reconnected jack shaft to bellcrank — Cost: 00 M/H: 1.5

5. Rebuilt power turbine — Cost: $40.00 M/H: 60.0

6. Replaced center window — Cost: $17.88 M/H: 2.0

7. Replaced R/N window — Cost: 9.00 M/H: 3.0

8. Replaced and remounted fenders — Cost: $10.00 M/H: 2.0

9. Replaced R/N wiper arm and blade — Cost: $5.00 M/H: 1.2

10. Replaced bellcrank on stbd fwd skirt lift — Cost: $50.00 M/H: 2.0

11. 100 hour check, Engine run Down — no cost M/H: 40.0

Total cost and man hours for routine maintenance excluding major refurbishment (Annex C) — Cost: $159.86 M/H: 120.2

B. Electronics

1. Replaced speed box and started trouble shooting electronic engine control power — no cost M/H: 24.0

2. Trouble shooting electronic engine controls power — no cost M/H: 72.0

3. Trouble shooting electronic engine controls power — no cost M/H: 43.5

4. Changed relay chassis. Trouble shooting electronic engine control power — M/H: 72.0

5. Trouble shooting electronic engine controls power — no cosg M/H: 72.0

6. Changed generator and voltage regulator. Trouble shooting electronic engine controls power — Cost: $380.00 M/H: 30.5

7. (NOTE: The following repairs resulted from accidental plow in) Removed comms package and repaired radar. Sent to YBI on work order #30463-3007-74
Parts: $82.50
Cost to date: $1054.00 M/H: 97.0

8. Repaired radar — Cost: W/O 30463-3007-73 M/H: 14.0

9. Repaired Channel 25, HF — Cost $5.00 M/H: .5

10. Repaired radar on work order 30463-3005-73 — Cost: $153.90 M/H: 15.0

11. Repaired CL 25 HF on W/O 30463-3024-73 — Cost: $264.62 M/H: 24.0

12. Repaired Clipper III VHF — Cost: $4.00 M/H: 19.0

13. Repaired Clipper III VHF — Cost: $7.00 M/H: 5.0

C. Electronics

1. Repaired rotating beacon — Cost: .94 M/H: .1

2. Repaired R/N wiper — Cost: 7.00 M/H: 1.2

3. Repaired gyro compass — Cost .12 M/H: .2

4 Repaired rotating beacon — Cost: .94 M/H: .2

5. Repaired R/N wiper — Cost: $20.00 M/H: 1.2

6. Replaced 5 panel lights — Cost: .30 M/H: .1

TOTAL COST: $380.30 TOTAL MAN HOURS: 314.3

FORT POINT MLB/SERV UNIT TRANSITION PHASE

Coast Guard Station Fort Point became a fully operational facility under the operational and administrative control of Coast Guard Group San Francisco 1 July 1972. The Station, dwellings, boat moorings, SERV hangar, and shop facilities were already constructed and satisfactorily equipped to support the unit mission. The authorized compliment of one officer and twenty-two enlisted were already on board.

The Station's operational facilities include two Bell SK-5 Surface Effect Rescue Vehicles (SERV) and two 44' Motor Life Boat (MLB). The two SERV's were on board prior to the unit becomming operational. One of the SERV's was in an operational status and the other in an extensive maintenance status. Of the two MLB's assigned only one was onboard in an operational status on 1 July. The other MLB was in a semi-annual haulout status at a local commercial dry dock facility and was not available for operational use until mid-July.

Annex C will discuss some of the tasks that the unit encountered during the transition phase of this unique operational study. The material provided is intended for use in determining the manning requirements for future Coast Guard Stations with this concept of operation. An attempt is made to show a cross-section of the man power distribution as it was applied to the various tasks that were encountered. Included will be a discussion on unit organization, Station maintenance, refurbishment of SERV 01 and 02 and the unit dual training program.

ORGANIZATION: The unit was organized into three basic departments; Administration, Operations, and engineering. The departmental responsibilities were similar in scope to those of any Coast Guard Station of comparable size and manning structure. However, because of the unit's dual mission responsibilities, each department was confronted with many additional tasks. The most demanding of these was the additional record keeping that was required by the one year operational study.

The unique dual response concept also demanded that new guidelines be promulgated so as to insure safe and reliable MLB/SERV operations and maintenance. Tabs C-1 through C-18 are examples of the operations and maintenance guidelines that have been developed to date. They have been included in the report primarily because they represent what is considered the

minum standards for this concept of operations. Although these instructions were written specifically for the joint operations of the Bell SK-5 SERV and the CG 44' MLB, it is felt that their basic contents can be easily modified and applied to any similar Boat/SERV operation regardless of the types being used.

MANNING: The unit had an authorized compliment of one officer and twenty-two enlisted personnel of various backgrounds and talents.

A breakdwon of the authorized manning structure along with the actual personnel presently attached is show below. Also shown, are the dates that each member reported aboard and the individual crew qualification to date.

AUTH BILLET	ON BOARD	DATE RPTD	MLB QUALS	SERV QUALS
1-LT	1-LT	6/72		
1-ENCS	1-BMCS	6/72	COXN	OP
1-BM1	1-ENC	6/72	COXN/ENG U/W	OP
2-BM2	1-EN1	6/72	ENG U/W	S/C
2-BM3	1-EN1	11/72	ENG U/W	S/C
1-EN1	1-BM1	6/72	COXN	OP
2-EN2	1-BM1	6/72	COXN	OP
2-EN3	1-AM1	6/72	---	OP
6-SN/SA	1-BM2	8/72	COXN	OP tng
1-FN/FA	1-AE2	6/72	---	OP
1-SK3	1-BM3	6/72	COXN	OP
1-AM2	1-EN3	7/72	ENG U/W	R/N
1-AE2	1-EN3	7/72	ENG U/W	R/N
1-ET3	1-EN3	7/72	ENG U/W	R/N
	1-EN3	7/72	ENG U/W	S/C
KEY:	1-EN3	7/72	ENG U/W	S/C
OP- SERV OPERATOR	1-ET3	7/72	S/C	S/C
R/N- SERV RADAR NAVIGATOR	1-EM3	7/72	ENG U/W	S/C
	1-SK3	7/72	S/C	
S/C- SAR CREW	1-SN	6/72	S/C	R/N
	1-SN	10/72	S/C	S/C
	1-SN	11/72	S/C	S/C tng
	1-SN	11/72	S/C	S/C tng
	1-SN	12/72	S/C	S/C tng

Obviously, the first few weeks of operations required extensive cross training for both MLB and SERV crews. This requirement coupled with the unusual demands of heavy SAR response and excessive maintenance for both the MLB's and SERV's weighed heavily on the unit for the first three months of operation. During this period the MLB and SERV responded to 181 SAR cases

with many of them requiring both types of craft (annex A). The net result of this was that in order to meet the operations and maintenance training requirements, most of the training had to be conducted after normal working hours and during actual operations. The effect of this situation on the SERV training program was significant and resulted in only a few of the trainees becoming crew qualified. Additionally, the availability of only one SERV during most of the first six months of operations, due to major hull maintenance required on each of the craft, only one two hour training flight was scheduled daily. On several occasions the training flight was cancelled because of unscheduled daily operational requirements. With the decrease in SAR operations in mid-September, more time became available for SERV training and a gradual increase in the operational dual qualifications of personnel was finally being realized. On the other hand, the SERV maintenance training had a more impressive record. This was partly due to the extensive SERV refurbishments that was being accomplished during the greater part of this six month period. Often the job had to be accomplished by the trainee with a minimum of training and supervision. At times this method of meeting both the training and maintenance requirements, simultaneously paid off with a finished product. However, there were occasions when the job had to be repeated. More often than not the result of the on-the-job training procedure, succeeded in producing SERV maintenance qualified personnel.

The MLB operations and maintenance training results were much more successful than that of the SERV's. The magnitude of the operations and maintenance requirement actually aided the trainee's learning process, by affording him the opportunity of first hand experience for many different types of situations, at an accelerated pace. The fact that the requirements for the MLB crew qualification are on the average less demanding than those for the SERV, the trainee was able to carry out many of the various operation and maintenance tasks after only a few hours of formal training. The unit's dual training program is explained later in this annex.

In analyzing the unit's six months of operation, it is considered that the manning structure for this unique unit was barely adequate to cope with the unit's many tasks, especially during the unit's transition phase. It is felt that a more realistic approach to the initial manning of a unit of this type would be to temporarily increase the compliment during the transition phase. This would provide the needed man power for coping with the numerous relatively simple problems that that accompanies all new ventures. The relief that this would provide should ultimately enhance the unit's dual training effort, especially that concerning SERV crews.

Another significant factor that confronted the unit, with regard to personnel, was the thirty percent turnover of personnel experienced during the six month period. This situation also affected the SERV training accomplishments. The effect that the turnover had on SERV training was primarily that concerning the time requirements for the various crew qualifications, especially for SERV operator. The time at the controls requirement for operator is the most crucial element of the overall learning process. In order to meet this requirement the trainee must be scheduled frequently for training flights and at close interval. Therefore, once the trainee begins SERV crew training he continues with each phase until he completes all of its requirements (Tab C-13). Consequently, the loss of an individual who has accumulated several hours of SERV underway time results in producing a negative effect on the units overall training efforts. An example of this resulted when a BM1 was transferred after accumulating forty hours craft time and qualified for SERV solo operator. To help relieve this problem in future endeavors of this type, it is suggested that consideration be given to a minimum 12 to 18 month duty assignment for all personnel selected for MLB/SERV dual training.

OPERATION AND MAINTENANCE MLB/SERV TRAINING: The training criteria that was utilized in the unit's training program consisted primarily of the already established MLB and SERV training programs. The applicable sections of the Small Boat Training Manual (CG-313) were appropriately modified and used for the training of the MLB crews. The SERV training program, with minor modifications, that was developed during the previous ACV evaluation program, including the established minimum crew qualification requirements, was used for the training of SERV crews. The unit's dual training program was applied as described in the following paragraph.

Upon reporting aboard, each trainee was given a training jacket that consisted of two parts. Part One contained the MLB syllabus for each of the MLB crew positions, and Part Two a syllabus for each of the SERV crew positions. As the trainee completed the requirements and successfully demonstrated his ability to perform a particular task, the item was noted in the trainee's jacket. Upon completing all the syllabus items he was designated in writing as being qualified.

The unit's training program called for each trainee to first qualify as SAR crewman on the MLB. From that point he advanced himself to the other MLB crew positions at the rate he was capable of. Depending on the trainee's background experience, the MLB crew training process generally took three to six weeks for coxn's, two to four weeks for boat underway engineer, and one to three weeks for SAR crewman.

On occasion and during the 44' MLB training period, the trainees were scheduled on SERV training and operational flights as observers. The purpose of that procedure was to gradually expose the trainee to the SERV and to it's crew requirements. Also, it provided an excellent means for accomplishing the area familiarization phase of the program in general. By gradual exposure to the SERV's operation the trainee was able to observe and interpret some of the overlapping operational procedures as they compared to the MLB operations. This precedure definitely assisted the trainee in becoming much more receptive to SERV crew training after the trainee became qualified on the MLB.

Upon completion of MLB crew training and designated as a MLB coxn, engineer, or SAR crewman, the trainee commenced SERV crew training.

Briefly, the SERV training program consisted of 3 phases of training. Phase One consisted of a three day ground school and was attended by all trainees. Phase Two, operator and radar navigator on-the-job training consisted of six weeks of basic operator/navigator training including routine procedures for post and pre flight maintenance. Phase Two of the SAR crewman training which overlapped, to some degree, with the MLB SAR crew training, consisted primarily of on the job training, directed towards SERV emergencies and routine operating procedures, and proper us of the craft outfitting equipment. The SAR crew training also included instruction on the post and pre flight maintenance requirements and procedures. Phase Three, craft operator trainee proficiency, was directed towards qualifying SERV operators. During this phase the operator trainee accumulated the required 50 hour minimum control time and the remaining SERV operator designee requirements. Upon completion of Phase Three the operator trainee received a check ride. Upon successful completion of the check ride the trainee was qualified as a SERV operator.

The importance of having an effective training program for the qualification of SERV operational and maintenance personnel cannot be overemphasized. The SERV hull construction, type of propulsion and other systems demand an expertise, beyond that required for conventional surface craft maintenance. For more details on the Coast Guard SERV training requirements, refer to the ACV evaluation report EU 3960.01 dated 15 October 1971.

During the past six months, the unit's training program has been successful in qualifying operational personnel as indicated below:

SERV			MLB			SERV/MLB DUAL QUAL		
new		existing	new		existing	new		existing
2	Operators	7	4	Coxn	7	2	Coxn/ Operator	4
6	Radar/Navigator	6	9	Engineer	8	15	R/N Engineer	6
22	SAR crewman	5	22	SAR crewmen	6	22	SAR Crewman	5

STATION FACILITIES: Generally, the condition of the station buildings, structures and maintenance support facilities on 1 July 1972 was good and considered adequate for the support of the unit's dual mission requirement. However, because of the age of the station coupled with a period of non-operational use, there existed some relatively major maintenance conditions that required immediate action. Shortly after the unit was established, a shore station maintenance program was set up and appropriate corrective action was initiated. With the support and assistance of Group San Francisco and the 12th District the maintenance program has been quite productive. To date action has been taken on all of the major discrepancies. Most have been scheduled for completion before the end of the current fiscal year.

The effect that the station maintenance requirements had on the unit's manpower resources amounted to ten percent of the unit's total manpower output. An additional ten percent was required for the support of the stations routine maintenance and upkeep.

The manpower drain for the support of these early maintenance problems was considered excessive at the time. Obviously, other unit programs had to absorb the losses. This situation may not seem to be overbearing to the casual observer, but when the total manpower force consists of only 22 men, the 20% loss takes on a rather significant meaning. As previously mentioned, a temporary increase of the crew compliment during the transition phase would help to alleviate this problem.

REFURBISHMENT OF SERV 01 AND 02: The material condition of both SK-5 SERV's at the time of the establishment of the unit was generally poor. Both craft were showing signs of their age and the effects of the extensive evaluation they had just completed. The operation of bothcraft, at remote sites in the Great Lakes and Chesapeake Bay areas had resulted in an accumulation of several hull maintenance deficiencies that required extensive repairs. Most of the hull deficiencies resulted from deteriorated rivets and structural members. The remote operation sites obviously lacked suitable facilities for major maintenance and repairs. Therefore, the major repairs were purposly delayed until the crafts return to Fort Point. A good portion of the crafts deterioration was located in non-exposed areas of the hull.

In many cases, it required the removal of exterior skin before it was detected. On both of the craft, large sections of the center body bottom and sub-decking had to be removed and replaced. On the SERV 02 the deck that supported the 304 gallon main fuel bladder buckled and had broken through in several places. This entire section had to be replaced. The actual work performed on both craft along with the cost of replacement materials is shown in figs. C-I and C-II.

All of the work that was required for both refurbishments was accomplished by unit personnel only. All of the necessary repairs were accomplished during one scheduled continuous maintenance period for each craft. All of the work performed was done at the Fort Point hangar facility.

The actual cost of the repair materials expended for the refurbishment of both SERV's was not included in the maintenance cost figures shown in Annex B of this report. These costs were purposly excluded because they did not represent deficiencies that resulted from the operational study, as was previously indicated.

A significant point of interest concerning the extensive refurbishment conducted on both craft is that during the entire six month period covered by this report only one SERV was available for operational use. However, this unit was still able to provide a ready (B-0) SERV for 88.5% of the six month period.

44' MOTOR LIFE BOAT(MLB): Generally, the material condition of the two MLB's and their outfitting was good and did not require any extensive expendatures of manpower or money. On the average, three personnel for each boat was require daily to support the boats hull and machinery requirements. The actual maintenance performed on each boat is outlined in Annex B. The MLB's were provided for operation 82% of the six month period.

MAJOR INSPECTION AND REFURBISHMENT FOR SERV 01

A. COST FOR MATERIALS

I.(a)	1.	Aluminum	26,626 sq. in.	$106.75
	2.	Rivets	13,621	204.46
	3.	PRC Kit	48	63.92
	4.	Misc Hardware & Parts		465.19
	5.	Skirt Material	1,000 sq. in.	4.00
	6.	Electrical Parts & Materials		996.47
			TOTAL	$1,440.89

(b) Materials for Major Inspection

1. Rivets:

(1)	AD42H	940	(14)	AD54S	2306
(2)	AD43H	160	(15)	AD55S	79
(3)	AD44H	422	(16)	AD56S	1440
(4)	AD45H	146	(17)	AD62H	55
(5)	AD42S	120	(18)	AD63H	282
(6)	AD43S	739	(19)	AD64H	647
(7)	AD44S	116	(20)	AD66H	181
(8)	AD52H	190	(21)	AD68H	721
(9)	AD53H	2151	(22)	AD62S	71
(10)	AD54H	733	(23)	AD63S	84
(11)	AD55H	196	(24)	AD64S	299
(12)	AD52S	290	(25)	AD65S	140
(13)	AD53S	991	(26)	AD66S	132
			TOTAL # EXPENDED		13,631

2. Aluminum Skin

	Thickness	sq. in.
(1)	.032	4,752
(2)	.040	17,930
(3)	.050	2,968
(4)	.063	439
(5)	.072	71
(6)	.080	466
	TOTAL	26,626

3. Skirt Material:

TOTAL: 1,000 sq. in.

(c) Maintenance man hours for Inspection and Refurbishment

(1)	**Hull and Mechanical**	**1800 hrs**
(2)	**Electrical**	**155 hrs**
	Total M/H	**1955 hrs**

(fig. C-I-1)

B. ACTUAL WORK PERFORMED ON SERV 01 HULL

I. Left Side Body

(a) #2 Outer skin panel
1. 765 sq. in. .032 aluminum
2. 130 AD54H
3. 17 AD63H
4. 1 pre-formed hat strip

(b) #4 &#5 Outer skin panel
1. 2079 sq.in. .032 aluminum
2. 71 AD44H
3. 270 AD53H

(c) Walkaway next to Cabin
1. 270 AD53H

(d) #2 &#3 Section boundary members
1. 1280 sq.in. .050 aluminum
2. 220 sq.in. .063 aluminum
3. 114 AD54H
4. 120 AD63H

(e) Outer skin patch #3
1. 54 sq.in. .032 aluminum
2. 50 AD43H

(f) #8 Outer skin panel patch
1. 36 sq.in. .032 aluminum
2. 15 AD55H
3. 30 AD52H

(g) Boundary member repair below forward puff port
1. 36 sq.in. .063 aluminum
2. 26 AD54H
3. 4 AD64H

(h) Boundary member repair below compass
1. 43 sq.in. .063 aluminum
2. 36 AD54H

(i) Various small repairs forward to aft of compass
1. 70 AD54H
2. 110 AD43H

(j) Boundary member near puff port forward to corner
1. 2 Struts
2. 540 sq.in. .050 aluminum
3. 570 sq.in. .032 aluminum
4. 75 sq.in. .040 aluminum
5. 50 AD62S
6. 38 AD62H
7. 71 AD66H
8. 40 AD68H
9. 70 AD63H

(fig. C-I-2)

(k) Hat strip back-up plates (bottom of buoyancy tank)
1. 1728 sq.in. .040 aluminum
2. 1250 AD53H
3. 190 AD54H

(l) Patch bottom buoyancy tank at 3rd set of struts
1. 270 sq.in. .040 aluminum
2. 145 AD53S
3. 30 AD55S

(m) Side of tank same area as above
1. 200 sq.in. .040 aluminum
2. 160 AD52H
3. 14 Struts brackets
4. 17 Struts
5. 86AD65S
6. 15 AD66H
7. 49 AD55S
8. 21 AD54H

(n) Repair to top forward tip of buoyancy tank
1. 140 sq.in. .040 aluminum
2. AD66H (50)
3. 36 AD64S
4. 38 AD53H

(o) Repair to lateral bag hat strips
1. 70 sq.in. .040 aluminum
2. 48 AD42H

(p) #1 Outer skin panel replacement
1. 1075 sq.in. .040 aluminum
2. 97 AD64H
3. 41 AD64S

(q) Replace front of panel (bow section)
1. 470 sq.in. .040 aluminum
2. 140 sq.in. .063 aluminum
3. 215 AD64H

II. Right Side Body

(a) Replace #1 outer skin panel
1. 1075 sq.in. .040 aluminum
2. 97 AD64H
3. 41 AD64S

(b) Flat walkaway next to cabin
1. 219 AD53H

(c) Boundary member below right pannier
1. 410 sq.in. .050 aluminum
2. 280 sq.in. .040 aluminum
3. 75 AD63H
4. 21 AD62S
5. 19 AD66H

(fig C-I-3)

(c) cont.
6. 31 AD68H
7. 84 AD63S
8. 39 7/16 bolts

(d) Patch bottom of buoyancy tank
1. 480 sq.in. .040 aluminum
2. 45 AD44S
3. 86 AD54H
4. 19" of extruded "T"

(e) Strut brackets (9)
1. 54 AD65S
2. 48 AD55H
3. 20 sq.in. .040 aluminum

(f) Replaced struts
1. 7 struts

III. Center Body

(a) Repairs to vertical stabilizer
1. 478 sq.in. .032 aluminum
2. 255 AD42H
3. 71 AD44S
4. 17 AD62H

(b) Repairs interior & exterior just forward stbd. stabilizer
1. 1175 sq.in. .040 aluminum
2. 351 AD44H
3. 62 AD55H
4. 205 AD43S

(c) Plenum bleed covers
1. 672 sq.in. .040 aluminum
2. 150 AD64H
3. 18 AD64S

(d) Patch on ballast tank cover
1. 144 sq.in. .040 aluminum
2. 104 AD53H

(e) Replacement of skin just aft nacelle struts
1. 782 sq.in. .040 aluminum
2. 348 AD53S

(f) Repair bottom of craft beneath fuel cell
1. 3756 sq.in .040 aluminum
2. 1160 AD56S

(fig C-I-4)

(f) cont
3. 498 AD53S
4. 450 AD43S
5. 290 AD52S
6. 61 AD64S
7. 70 AD66S

(g) Repairs to bottom by left rear landing pad
1. 2300 sq.in. .040 aluminum
2. 690 AD54S
3. 92 AD64S
4. 36 AD66S

(h) Replacement of skin bottom below right stabilizer
1. 415 sq.in. .040 aluminum
2. 19" extruded "L" angle
3. 36" "Z" channel
4. 120 AD42S

(i) Hat strip replacement aft left center body
1. 156 AD54S

(j) 12 feet "L" channel for keel bag and back side of periphal bag forward

(k) Patches beneath 2 hand rail supports
(1) 71 sq.in. .072 aluminum
(2) 38 AD64H
(3) 10 AD64S

(l) Replace 13 patches where foam installed
(1) 1872 sq.in. .040 aluminum
(2) 1040 AD54S

(m) Install rubber gasket around #2 transmission
(1) 26 AD66H

(n) Replace hatch spring covers

(o) Replace 6 section hinge hat strip
(1) 280 AD56S
(2) 120 AD54S
(3) 432 sq.in. .040 aluminum

(p) Left forward corner center body
(1) 205 sq.in. .040 aluminum
(2) 85 AD42H
(3) 34 AD64H

(fig C-I-5)

(q) Ramp repairs
(1) 738 sq.in. .050 aluminum
(2) 770 sq.in. .032 aluminum
(3) 1@ angle 1" x 1" x 41" .063 110°
(4) 300 AD54S
(5) 552 AD42H
(6) 146 AD45H

IV. Miscellaneous Repairs

(a) Replaced 7 feet of walkway tread

(b) (1) 34 "V" hinge for lateral and rear bags (on craft
(2) 39 standard skirt hinge (on craft)
(3) 117 extruded skirt hinge (on craft)

(c) Hatch lock
(1) 8" extruded "T" angle
(2) 13 AD64H

(d) Pannier
(1) Replaced 4 locks
(2) 30 sq.in. .040 aluminum
(3) 16 sq.in. .080 aluminum
(4) 60 AD54H

(e) Patches bow each side of ramp center body
(1) 264 sq.in. .040 aluminum
(2) 84 AD43S
(3) 71 AD54H
(4) 26 AD66S

(f) Boundary member tie-ins
(1) 450 sq.in. .080 aluminum

(g) Changed #1 and #2 gear boxes

(h) Performed 100 hr inspection on engine

(i) Changed oil and filter main and engine oil system

(j) Changed fuel filters

(k) Replaced left rudder cable

(l) Bushed rudder hinge points

(m) Replaced 7 fenders

(n) Repaired rear bags and keel bag

(o) Repaired main skirt

(p) Painted entire cfaft

(q) Replaced center winshield and gasket

(r) Replaced Radar window and gasket

(s) Rebuilt 8 hydraulic cylinders

(t) Rebushed skirt lift bell cranks

(u) Replaced all skirt lift chains and shackles

(v) Replaced 108 feet of hinge pin for skirt and bags

(w) Replaced 36 feet of erosion strip on rear bags

V. Electrical/Electronic Work Accomplished

(a) Replaced Port navigation light Man Hours: 10.0
(1) Rotax Type H 1707 light fixture 1ea Cost: $50.0
(2) MS 25190A16 Aircraft wire #16 AWG 3'
(3) Atlas 995-3219 1ea

(b) Replaced forward range light M/H: 6.0
(1) Rotax type H.2002 light 1ea Cost: $35.00
(2) Atlas 995-2276 Lamp 1ea

(c) Replaced engine starter M/H: 4.0
(1) Aircraft starter Type E-5 Cost: $150.00
P/N: 20069-008 1ea

(d) Replaced engine starter terminal block M/H: 0.6
(1) Terminal block P/N 37B200321G002 Cost: .60

(e) Replaced engine stop switch M/H: 2.0
(1) G.E. CR 104 switch 1ea Cost: .00

(f) Replaced and adjusted engine control box M/H: 4.0
(1) Reliance Speed sensing switching no cost
system P/N A7-11 1 ea

(g) Replaced engine relay chassis M/H 6.0
(1) Relay chassis P/N L 11073 1ea no cost

(h) Replaced auxilliary fuel tank wiring M/H: 18.0
(1) Aircraft wire MS 25190B20 AWG #20
50 feet Cost 2.50
(2) Splices MS 25181-1 AWG size 18-22 12ea

(i) Replaced ballast indicating system M/H: 3.2
(1) Aircraft wire MS 25190B20 Cost: 0.18
AWG #20 50 feet
(2) Splices MS 2518-1-1 AWG Size #18 & #22 4ea

(j) Repaired forward and aft fuel ballast pump wiring
(1) Aircraft wire MS 25190B16 M/H 3.0
AWG Size #16 3 feet Cost: 3.15
(2) Splices ms 25181-2 AWG Size #14 & #16 3 feet
(3) A/N connector (receptical) MS 3102R-125-3P 1ea
(4) A/N connector (plug) MS 3106R-125-3S 1ea

(k) Replaced center windshield AS54 M/H 4.0
(1) American Bosch WWC 20-20 Cost: 60.00
Windshield wiper unit 1 ea
(2) ANCO 18" wiper blade P/N 18798 1ea
(3) Wiper arm shaft assy P/N SH 721076 1 ea

(l) Replaced rotating beacon M/H: 4.5
(1) Beacon light assy Cost: 50.00
P/N 41635-3-28 1ea

(m) Replaced five wire element bushings M/H 0.5
(1) Gravner D.3891 3ea no cost
(2) Gravner D.3892 2ea

(n) Completed 100 hr electrical check M/H 24.0

(o) Removed and repaired communications package
on W/O #30463-3015-73 M/H: 63.0
(1) KAAR CH25 HF AM/SSB 1 ea Cost: 645.04
(2) KAAR CLIPPER III VHF/FM 1ea

(p) Removed and cleaned searchlight M/H: 2.5
no cost

(fig. C-I-8)

MAJOR INSPECTION AND REFURBISHMENT FOR SERV 02

A. COST FOR MATERIALS

I.	(a)1.Aluminum	17,488 sq.in.	$63.00
	2. Rivets	7,614	114.16
	3. Skirt Material	9,965 sq.in.	40.00
	4. Misc Hardware		40.00
	5. Large Area Washer	4,526	12.60
		SUB TOTAL:	$269.76
	(b) 1. Hull and mechanical manhours for major inspection		700 M/H
	(c) PRC Sealant 24 kts.		$30.96
	(d) Electrical Parts and Materials		$370.00
	(e) Electrical Inspection		262 M/H
		TOTAL COST:	$700.72
		TOTAL M/H:	962

B. ACTUAL WORK PERFORMED ON SERV 02 HULL

I. Center Body

(a) Replace outer skin beneath fuel cell M/H: 72.0
1. 4716 sq.in. .050 aluminum
2. 360 AD56H
3. 710 AD53H

(b) 3 patches on aft bulkhead in fuel bay M/H: 20.0
1. 105 sq.in. .050 aluminum
2. 96 AD54H
3. 32 AD52H

(c) Patch inner deck of fuel bay M/H: 43.0
1. 756 sq.in. .050 aluminum
2. 110 AD54H
3. 64 AD56H
4. 75 AD52H

(d) Keel bag hinge line repairs M/H: included in B.I.(a)
1. 35 AD66S
2. 12" aluminum angle 1" legs

(e) Left lateral bag hinge line M/H: 8.0
1. 32" extruded "T" with 1" legs .125" thick
2. 150 sq.in. .050 aluminum
3. 63 AD56H
4. 10 AD66H

(f) Skin repair beneath center body under left stabilizer
1. 224 sq.in. .040 aluminum M/H: 8.0
2. 54 AD54H
3. 30 AD56H

(g) Repairs to bottom and hat strips right rear of center body M/H: 21.0
1. 62 AD55H
2. 360 sq.in. .040 aluminum
3. 150 sq.in. .050 aluminum
4. 80 AD56H
5. 10 AD64H

(h) Repairs to deck in bow compartment M/H: 6.5
1. 196 sq.in. .050 aluminum
2. 65 AD55H

(i) Replace angle above aft buoyance tank M/H: 3.0
1. 1" angle .050 thick 36" long
2. 46 AD55S

(j) Replace skin just forward and above aft ballast
1. 600 sq.in. .050 aluminum M/H: 25.0
2. 90 AD53H
3. 36 AD55H rivets

(k) Repair to area where heater exhaust was removed
1. 24 sq.in. .040 aluminum M/H: 1.5
2. 33 AD53H

(l) Repairs to engine and transmission cowling
1. 200 sq.in. .040 aluminum M/H: 10.0
2. 96 AD53H

(m) Replace panel just aft of rear window right side
1. 560 sq.in. .040 aluminum M/H: 8.0
2. 92 AD55H

(o) Repairs to bellmouth where guard rails connect right side and left side M/H: 6.0
1. 2 kits of Scotch weld

(p) Repairs to deck just forward of vertical stabilizer
1. 180 sq.in. .040 aluminum
2. 86 AD53H
3. 30 AD55H

(fig. C-II-2)

(q) Replace rivets in fairing beneath #2 gearbox
1. 36 AD54H M/H: 1.0

(r) Replace rivets below prop M/H: 1.0
1. 14 AD55H rivets

(s) Replace upper elevator cable M/H: 6.0
1. 1 cable assembly

(t) Replace operators side window M/H: 2.0
1. 1 window

(u) Replace rivets bottom of center of body M/H: 1.0
1. 14 AD55H
2. 6 AD53H
3. 4 AD64H

(v) Repairs to prop guard rail mounting bracket area
1. 116 sq.in. .050 aluminum
2. 92 AD56H
3. 31 AD53H

II. Left Side Body

(a) Repair to boundary member at forward puff port
1. 6 AD64S M/H: 1.0
2. 9 feet rubber gasket

(b) #3 strut repairs M/H: 5.0
1. 18 sq.in. .050 aluminum
2. 20 AD55S
3. preformed strut bracket

(c) Repair to bottom area of left pannier M/H: 5.0
1. 288 sq.in. .032 aluminum
2. 28 AD53H
3. 30 AD55H
4. 12 AD64H

(d) Repair to 5th row strut area M/H: 4.0
1. 18 sq.in. .040 aluminum
2. 12 AD54H
3. 8 AD56H

(e) #1 and #2 boundary members replaced M/H: 104.0
1. 1200 sq.in. .050 aluminum
2. 20 an 3-3a bolts
3. 120 AD64S
4. 30 AD55S

(f) Repair to 2 rips just forward of rear puff port in skin
1. 52 sq.in. .032 aluminum M/H: 3.5
2. 72 AD54H

(g) Moved attaching fittings for front puff port
1. M/H: 1.0

(h) Replace plennum bleed cover M/H: 2.0
1. 255 sq.in. .050 aluminum
2. 63 AD65H rivets
3. 18 AD63H

(i) Repair punctures rear section of walkway M/H: 2.0
1. 131 sq.in. .040 aluminum
2. 97 AD54H

(j) Repair skin outboard of filter duct M/H: 1.5
1. 36 sq.in. .040 aluminum
2. 44 AD53H

(k) Repair cracks in flat walkway M/H: 4.0
1. 86 sq.in. .040 aluminum
2. 71 AD53H

(l) Re-secure top of pannier M/H: 0.3
1. 21 AD55H

(m) Replace bad rivets bottom M/H: 1.0
1. 31 AD53H

III. Right Side Body

(a) Repair to skirt hinge forward inboard M/H: 14.0
1. 8" extruded "T" 1" legs
2. 20 AD62H
3. 4 AD64H
4. 30 AD55H
5. 60 sq.in. .040 aluminum

(b) Hat strip hinge line for lateral bag and hinges
1. 70 sq.in. .050 aluminum M/H: 2.0
2. 40 AD56H

(c) Hat strip and back up plate replaced M/H: 5.0
1. 64 sq.in. .040 aluminum
2. 50 AD55H
3. 10 AD53H

(d) Skin repair forward of forward puff port M/H: 0.6
1. 16 sq.in. .032 aluminum
2. 32 AD53H

(e) Repair to #8 and #9 row struts and mounts M/H: 8.0
1. 48 sq.in. .040 aluminum
2. 36 AD54H

(e) cont.
3. 16 AD65H
4. 2 pre-formed strut brackets

(f) Skin repairs inboard near skirt lift M/H: 1.0
1. 24 sq.in. .032 aluminum
2. 48 AD53H

(g) Replace plennum bleed cover M/H: 2.0
1. 260 sq.in. .050 aluminum
2. 64 AD65H
3. 19 AD63H

(h) Rivets replaced in bottom
1. 85 AD53H
2. 15 AD53H

(i) Repair to cracks in rear section of walkway
1. 205 sq.in. .050 aluminum
2. 96 AD53H
3. 58 AD55H

(j) Repair hat channels #11 and #12
1. 16 AD56H
2. 5 AD64H

(k) Repairs to boundary member at rear puff port to beneath pannier M/H: 48.0
1. 936 sq.in. .050 aluminum
2. 300 AD64S
3. 115 AD65S
4. 15 AD63S
5. 6 pre-formed brackets

IV. Miscellaneous Work

(a) Replace hinges thoughout bottom of craft
1. M/H: 12.0

(b) Repair to keel bag M/H: 46.0
1. 7100 sq.in. skirt material
2. 1026 AD 68H
3. 1870 #10 large area washers
4. 116 half pennies

(c) Right and left rear bags M/H: 80.0
1. 2250 sq.in. skirt material
2. 1850 68H
3. 2010 #10 large area washers
4. 100 half-pennies
5. 15 pre-formed drag strips

(fig-C-II-5)

(d) Right and left lateral bags M/H: 24.0
1. 615 sq.in. skirt material
2. 215 AD 68H
3. 400 #10 large area washers
4. 30 half-pennies

V. Electrical Repairs to SERV 38102

(a) Repaired and repainted main instrument panel M/H: 50.0
1. 6oz gray paint Cost: .47
2. 6oz zinc chromate primer
3. 15' wire bundle twine P/N MIL-T- 713-C

(b) Cleaned and repaired Compass Mount M/H: 4.0
1. No supplies used. Reused sll existing parts

(c) Repaired and repainted operators overhead instrument console M/H: 20.0
1. 4oz gray paint cost: .28
2. 3oz zinc chromate primer
3. 7' wire bundle twine P/N MIL-T- 713-C

(d) Cleaned and repainted and remounted all wire bundles in main cabin M/H: 40.0
1. 600' wire bundle twine Cost: .56
P/N MIL-T- 713-C

(e) Cleaned corrosion from cells in Battery M/H: 0.5
S/N 293
1. No materials expended

(f) Replaced speed sensing switch M/H: 9.0
1. lea speed box P/N A7-11 S/N 6510002

(g) Replaced crydom temp control unit M/H: 2.0
1. Crydom switch P/N CL894 P/N 1010 Cost$200.00

(h) Removed 28 volt outlets and wiring M/H: 15.0
1. No parts or material used

(i) Cleaned generator terminals M/H: 1.0
1. No parts or materials used

(j) Cleaned and repainted battery mounts M/H: 14.0
1. 12oz blue paint cost: $1.04
2. 12oz gray paint

(fig. C-II-6)

(k) Removed and cleaned fuse panel and holders M/H: 3.5
1. No parts or materials used Cost: .00

(l) Replaced generator voltage regulator M/H: 3.0
1. Voltage regulator P/N 902F317-1 Cost: $150.00

(m) Cleaned and reinstalled starter time delay M/H: 1.0
1. No parts or materials used

(n) Cleaned and reinstalled overvoltage relay M/H: 1.0
1. No parts or supplies used

(o) Cleaned, tested and reinstalled fire control M/H: 8.0
1. No parts or supplies used

(p) Repaired chafed wire in hydraulic bay M/H: 0.4
1. Splice MS25181 1ea Cost: .06

(q) Removed, cleaned and reinstalled starter M/H: 1.0
1. 2ea nuts, steel stop Cost: 2.70
2. 1ea brush cover

(r) Removed, cleaned and reinstalled terminal board M/H: 3.0
1. Misc hardware Cost. .20

(t) Removed, cleaned and reinstalled A/N connectors on instrument console M/H: 8.0
1. No parts or supplies used

(u) Removed, repaired and reinstalled engine control and fuse panel mount M/H: 24.0
1. No parts or materials expended

(v)Removed, cleaned and reinstalled terminal board DA
1. Misc hardware M/H: 3.0
Cost: .30

(w) Rerouted overstressed wire in engine bay M/H: 1.5
1. 6' MIL-T-43435

VI Electronic Repairs to SERV 38102

(a) Replaced vertical lift control M/H: 1.5
1.1ea potentiometer Cost: 3.50
2. 1ea knob

(b) Repaired range-miles control M/H:
1. Repaired existing knob

(c) Replaced panel lights knob M/H: 1.5
1. 1ea knob Cost: 1.00

(d) Cleaned shockmounts on Radar display unit M/H: 2.0
1. Used existing hardware

(e) Cleaned screws in handle on display unit M/H: .5
1. No parts or materials expended

(f) Cleaned Radar scanner switch M/H: .5
1. No parts or materials expended

(g) Cleaned power switch on radar M/H: .5
1. No parts or materials expended

(h) Cleaned radar xmit switch M/H: .5
1. No parts or materials expended

(i) Cleaned mount bolts on radar display unit M/H: 1.4
1. No parts or materials expended

(j) Cleaned, painted drawer hinges on radar M/H: .6
Dispaly unit Cost: .40
1. Paint, clear 6oz

(k) Cleaned and painted radar display unit
mounting plate M/H: 1.5
1. Paint, zinc chrom ate 8oz Cost: 1.09
2. Paint, gray 16oz

(l) Cleaned radar T/R unit M/H: 3.5
1. No parts or materials used

(m) replaced VHF converter M/H: 4.0
1. Used existing hardware

(n) Cleaned radar sea clutter knob M/H: .5
1. Used existing parts

(o) Cleaned exterior of Display unit M/H: .2
1. No materials expended

(p) Cleaned hinges on display unit hood M/H: 1.5
1. Used existing parts

(q) Cleaned corrosion from HF XCVR CH 25 AM/SSB
1. No parts or materials expended M/H: 1.4

(r) Cleaned corrosion from HF ant. coupler M/H: 1.0
1. No parts or materials expended

(s) Cleaned I.C.S. J Box M/H: 8.0
1. No parts or materials expended

(t) Cleaned ant. and microphone connections on COMCO 610 VHF
1. No parts or materials expended M/H: .4

(u) Replaced VHF/ICS A/N connector at COMCO 610 VHF M/H: 8.0
1. A/N connex, plug MS 3116 P145-6P Cost: $7.50

(v) Cleaned Clipper III VHF M/H: 1.5
1. No parts or materials expended

(w) Cleaned and sealed HF ant. M/H: .4
1. RTV 108 sealant 8 oz Cost: .60

(x) Removed and cleanedXING AMPS M/H: 6.0
1. No parts or materials expended

(y) Replaced panel lights on display unit M/H: .2
1. 2ea 1amp 327 Cost: .30

(z) Cleaned inside of radar display unit M/H: 1.2
1. No parts or materials expended

(fig. C-II-9)

DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD

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Coast Guard Station
Fort Point
Presidio of San Francisco
CA. 94129

1 August 1972

Coast Guard Station Fort Point Instruction 1221

Subj: Duty Section ACV/MLB Maintenance Personnel, assigning and duties of

1. Purpose: To set forth the policies for assigning personnel to these tasks and to define the duties and responsibilities involved.

2. Action: Maintenance crews for Ready ACV.

a. Maintenance personnel shall be assigned each day, immediately following morning muster, to qualified personnel from within the Duty Section. The Duty section leader or Engineering Officer shall be responsible for assigning the personnel.

b. The duties of the ACV ready craft maintenance crew shall be to perform all pre-flight, post flight and routine servicing of the craft during their duty day.

c. The senior man in the maintenance crew shall be designated in charge and he shall be responsible to the maintenance Chief for the performance of the maintenance line crew.

d. During the duty section lunch breaks, 1130-1200, the duty section of the preceeding day shall assume the responsibility of the ACV line crew. The duty section line crew shall make their own provisions for lunch relief.

3. Action: Maintenance Crews for Ready 44' MLB

a, Maintenance personnel shall be assigned each day immediately following morning muster, to be qualified personnel from within the duty section. The duty section leader, BM in charge of the Boat Docks, or E.O. shall be responsible for assigning the personnel.

b. The duties of the MLB Ready Boat maintenance crew shall be to correct all routine hull and Mechanical discrepancies reported by the ready boat crew.

c. The provisions of paragraphs 2C and 2D, above, also apply for M.L.B.

4. Effective Date: This instruction is effective immediately:

W.E. WALKER
COMMANDING OFFICER

DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD

MAILING ADDRESS:
Commanding Officer
CG Station Fort Point
Presidio of San Francisco
CA 94129

1 August 1972

Coast Guard Station Fort Point Instruction 3100.1

Subj: Emergency proceedures for ACV shutdown in water

Purpose: This instruction provides procedures to be followed in the event of an unscheduled shutdown on the water.

Discussion: The sinking of ACV 03 in Lake Huron in November 1971 dictated the publishing of more definative proceedures to be followed in the event of an unscheduled engine shutdown. Modifications have been made to ACV 01 and 02 relative to the installation of positive buoyancy material, in the crafts buoynacy system. This instruction prescribes the general guidelines to be used in the event of a shutdown on the water. No attempt is made to cover all possible situations that might arise and the sound judgement of the operator will play the most important position in any emergency situation.

1. In the event of an unscheduled turbine shutdown the following proceedures will be carried out:
   a. Operator: Attempt a restart as soon as practicable after reviewing the circumstances leading to the shutdown.
   b. Radar/Navigator: Establish radio contact with the base and advise them of the crafts position and the situation.

2. If the restart attempt is not successful or delayed for extensive trouble shooting and/or repairs, the following procedures will be carried out:
   a. Request a Coast Guard boat be dispatched for possible towing.
   b. Set the anchor (enclosure 1).
   c. Keep a careful watch on the craft trim and dewater as necessary using the established proceedures (enclosure 2).
   d. Trouble shoot for mechanical problems and attempt repairs and restart.
   e. Keep the Base station advised on all changes concerning the situation.
   f. Make preparations to be towed.

3. At the first sign of loss in buoyancy or any change in the crafts trim remove the life raft from the pannier to the side deck walkway. Commence pumping of the affected buoyancy tank. (Enclosure 2)

Coast Guard Station Fort Point Instruction 3100.1 Cont.

4. In the event that the flooding cannot be controlled make preparations for abandoning the craft by inflating the life raft or rafts. Continue attempts to dewater as long as conditions permit, attempt to lighten the craft by one or all of the following proceedures:

a. Jettison or relocate any sand ballast.
b. Jettison or relocate other portable material on the craft or in the cabin.
c. If the craft is settling by the stern only, pump the liquid ballast forward.
d. If the craft is settling to the port or starboard, pump the liquid ballast overboard (from aft ballast tank). Siphen the Aux fuel tank on the low side overboard. (Enclosure 3). Continue to shift portable materials and personnel to obtain best possible trim. Maintain on board the ACV only those personnel required for dewatering and trim. All other personnel should be in life rafts.

Note: In the winter or when exposure may be a problems, all personnel not wearing wet suits don exposure suits prior to boarding the raft. They also will take with them any materials that will assist in their survival and degection, such as blankets, pyrotechnics, portable transcievers, ect. Keep the rafts secured to the craft until directed to cut them loose by the person in charge. The personnel remaining on board will continue attempts to trim and dewater the craft. Should all of the foregoing attempts fail to control the flooding, an additional consideration is to pump the fuel from the main cell overboard. With the installation of positive bouyancy materials and the coordinated efforts of the crew, there is virtually no possibility of the craft sinking.

5. If for any reason the crew abandons the craft, the life ring will be secured with the line provided, to the exterior of the craft. This will assist in locating the craft in the unlikely event that it sinks.

6. On the arrival of the Coast Guard boat, if there is nay question concerning the ability of the craft to be towed to a Coast Guard facility, tow the craft to shallow water or a sandy beach area where repairs can be made.

Effective Date: This instruction is effective upon receipt.

W.E. WALLER
Commanding Officer

Enclosures 1, 2, 3,

Enclosure (1)

Subj: Anchoring Proceedures, air cushion vehicle

1. Deep Water Anchor (Bow)

a. Attach one end of the bow towing bridle to bow hoisting pad.
b. Remove the 200 Ft anchor line from the pannier and make it ready for running by flaking down on side deck or coiling in cabin.
c. Attach the shackled end of the anchor line to the anchor.
d. Pass the end of the bridle through the anchor line thimble and secure to opposite bow hoist fitting.
e. Throw anchor overboard and pay out line until a strain is taken on the bridle.
f. Keep check to determine if anchor is holding.

2. Deep Water Anchor (Port/Starboard Side)

a. Make the anchor and line ready for running as described in 1a to 1c above.
b. Attach one end of the special side mooring bridle to either the bow or quarter cleat.
c. Pass mooring bridle through anchor line thimble and secure to other cleat.
d. Throw anchor overboard and play out line until a strain is taken.
e. Keep a check to determine if anchor is holding.
f. This method of anchoring should be considered when sea chop off the bow would make it difficult to use the bow door without shipping water into the cabin.

3. Shallow Water Anchor, 30 Foot or less(Port/Starboard Side)

a. With this method the bow or side bridle is not used. the anchor line is attached directly to the bow cleat.
b. With this type of moor the anchor line can be adjusted as conditions dictate.
c. If the craft sustains damage on one side, work the anchor from the opposite side.

4. General

No less than two crewmen should be assigned to the anchor detail and both shall be wearing life jackets and any other special clothing that conditions dictate.

Enclosure(2)

Dubj: Dewatering Proceedures SK-5 Air Cushion Vehicle

1. Buoyancy Tanks

a. Two methods are available on board the craft to dewater the bouyancy compartments of the ACV.

(1) HandPump is used for dewatering small amounts only. Capacity is (1) gallon per seven (7) strokes.

(2) Homelite XL1½ Salvage and Fire Pump. This pump has been fitted with an eductor amd adapter for dewatering the bouyancy tanks by using the standby deck fittings. Capacity of the pump is 70 gallons per min. and should be used for dewatering large quantities of water.

b. A second method of dewatering can be provided by MLB's and UTB's with the use of the FZZ Fire and Salvage pump carried on board. This pump is usually fitted with an eductor and 1½ inch suction hose. With the use of a special adapter, carried on board the ACV (Sar Box), this pump can remove an additional 100 gallons of water per minute.
Note: When dewatering the bouyancy tanks do not remove the cap on the standpipe until the pump is ready to pump. Once Cap is removed, the trapped air escapes and flooding will be expediated.

2. Cabin Area and Pannier

a. The Cabin area can be dewatered with the built in bilge pump and or for the Homelite XL1½ Fire Salvage Pump. When used for this purpose, remove eductor and put pump with straight line suction hose provided with pump. If the bilge pump that is installed is running but failing to remove water, check to determine if discharge hose is obstructed, possibly with ice. If this is the case, a second length of hose is provided in the general area of the pump. This can be fitted to discharge side of the bilge pump and lead out the hinged side window.

b. The Panniers can be dewatered with the Homelite XL1½ Salvage and Fire pump with eductor removed and pump fitted with a straight line suction hose provided with the pump.

c. When the cabin bilge pump is used in below freezing temperatures, an anti-freeze solution should be circulated through the system to insure it remains free of obstruction.

ENCLOSURE (3)

Subj: Lightening Craft for Trim and Stability

1. Defueling Aux fuel tank will cause loss of weight of the craft and help regain trim. The empty tank will also provide additional reserve bouyancy. To defuel, remove the filler cap and insert a three foot length of hose. A suitable hose is located in the fuel accessory bay port side. Fuel is removed by siphoning.

2. Defueling Ballast system decreases craft weight and increases reserve buoyancy. To defuel this system, follow the same procedures used intransfering the fuel from the ballast system to the main fuel cell. Put all the fuel in the aft ballast tank, disconnect the line in the fuel accessory bay and lead the hose over the side. Transfer the fuel forward and fuel will be pumped over the side.

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1 August 1972

ACV Unit Instruction 3100.2

Subj: ACV General Operating Procedures; equipment allowance

Purpose: This instruction establishes the equipment allowance for the air cushion vehicle and the requirement for daily checks.

Discussion: Past experieance has demonstrated the importance of maintaining the on-board allowence of special equipment. Failure to have this equipment aboard and in operatable condition will adversly affect the ability of the craft and crew to carry out its mission.

1. Enclosure I to this instruction provides a list of equipment along with its storage location in the craft. This list will be used to check the equipment prior to each days operation. Previously published craft allowance lists are superceeded by this instruction.

2. The responsibility for insuring compliance with this instruction rests with the CO/OinC, but the daily check may be delegated to the Pre/Post-flight crews.

3. The more notable additions to the previous allowance list are indicated below:

a. 200' anchor line and anchor (left pannier).

b. Additional life raft (in cabin), original life raft in right pannier. (Note: Check for proper CO2 bottle hook up.)

c. Keep the panels installed over electrical equipment, aft of cabin.

d. Standby discharge hose for bilge pump. (on shelf aft of cabin).

e. Homelite fire and salvage pump, fitted with eductor.

f. FZZ Salvage pump suction adapter. (SAR Box).

W.E. Waller

W.E. WALLER
Commanding Officer

Enclosure: Allowance List

DESCRIPTION	AMOUNT	LOCATION ON CRAFT
Life Preservers	9 each	Under seats/Aft Bulkhead Shelves
Life Ring	1 each	200' Poly Prop Line Port Bulkhd.
Work Jackets(Life)	4 each	Aft Bulkhead Shelves
Mk 7 Life Raft, Rubber	2 each	Port Pannier/Cabin
Mirror Signal MK-3	1 each	Nav Pouch
Harness Safety Swimmer	1 each	SAR Box
Tending Line Swimmer	50 Feet	SAR Box
Whistle, Ball	2 each	1 SAR Box, 1 NAV Bag
Horn, Manual, Fog	1 each	SAR Box
Horn, Aerosal, Fog Spare	1 each	SAR Box
Binoculars	1 each	Back of Seat
Flashlight 2 Cell	1 each	Nav Bag
Battery D Cell	2 each	Tool Box
Signal Lit, Very Service	1 each	SAR Box
Signal Smoke Illumination Dist.	12 each	SAR Box
Signal Kit MK-79	1 each	SAR Box
Parrell Rule	1 each	NAV Bag
Area Charts	1 each	NAV Bag
Nav Instrument Kit	1 each	NAV Bag
Tide and Current Table	1 each	Nav Bag
SK-5 Op/Maint Manual	1 each	Plastic Bag- AFT Bulkhead Shelf
Nautical Slide Rule	1 each	NAV Bag
Pencils, Pen	3 each	NAV Bag
First Aid Kit	1 each	Mounted on Bulkhead Starboard
Hook, Boat 8FT	1 each	Mounted on Starboard Walkway.
Grapnel, Marine Wt 41bs	1 each	Starboard Bow Compartment
Buddy Jumper Cable	1 each	Starboard Pannier
Tow Bridle	1 each	Tow Line Box
Tow 200FT Poly Propalene	1 each	Starboard Pannier
Anchor 200 Ft Line	1 each	Starboard Pannier
Mooring Line	3 each	Tow Line Box
Fire Extinguosher	1 each	Mounted Aft Bulkhead Shelves
Extinguisher Dry Chemical	1 each	Cabin

DESCRIPTION	AMOUNT	LOCATION ON CRAFT
Chamois	1 each	Radar Support
Operator Checklist	1 each	Nav Bag
SAR Folder and Log	1 each	Radar Nav Seat
Tool Box	1 each	Mounted on deck Behind Op Seat
Lube Oil	6 QTS	Under Radar Seat
SAR Box	1 each	Mounted on Deck
Blanket	1 each	SAR Box
Fuses, Spare	Mis	SAR Box
Kapok Heaving Line	1 each	Tow Line Box
Signal Kit	2 each	SAR Box
Knee Board	1 each	Nav Bag
Hatchet	1 each	SAR Box
Light, Hand	1 each	SAR Box
Hand Bilge Pump	1 each	SAR Box
Homelite Pump	1 each	Starboard Bow Compartment
FZZ Pump Suction	1 each	SAR Box
line adapter	1 each	SAR Box
Cabin Bilge Pump	1 each	AFT Bulkhead by Bilge Pump
Aux Hose	1 each	AFT Bulkhead by Bilge Pump
CG Station Fort Point, ACV OP/INST	1 Set	Nav Bag

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1 August 1972

Station Fort Point Instruction 3100.3

Subj: SERV Radar/Navigator duties and practices; standardization of

1. Purpose: To establish standardized duties and practices of the SERV Radar/Navigator.

2. Objectives: (a) To insure and increase the efficientcy of the vital SERV Crew member in the performance of his duties. (b) To assist the Radar/Navigator Instructor and his student.

3. Scope: This instruction will cover the various functions of the Radar/Navigator in order to clearly delineate his duties and aid him in uniformly performing his various tasks.

4. Discussion: (a) A recent examination of the Radar/Navigator duties and practices, has dictated the need for establishing more definative guidelines that will aid in the performance of these duties. No attempt is made in this instruction to cover all possible situations that might arise, and it is understood that the nature of the many and varied tasks performed, at this position, demands a large degree of flexibility on the part of the Radar/Navigator. Occasionally, standard practices will have to be deviated from, to best accomplish the job at hand. (b) The Radar Navigator is second in Command of the craft, corresponding some-what ot the co-pilot of an aircraft or an engineer aboard a CG boat. In this capacity he is expected, ideally, to be capable of performing the duties of craft commander in the event of extenuating circumstances. His two prime duties are the navigation of the craft and the maintenance of craft communications.

5. Proceedures for SERV Radar Navigation:
(a) The Radar Navigator's prime navigation tool is the radar. With it he can plot courses, conduct searches and guide the craft through obstacles. The technical facets of the radar operation will not be discussed in this instruction.
(b) All R/Ns should strive to be consistent with proscribed practices in regard to the reporting of targets and changes of craft course. Virtually all targets should be reported in the following manner: "Target, 15 degrees right, one half mile." Thereafter, an attempt should be made to amplify the original report with such information as the target's course, if uderway, and identification of the target. The latter can often be accomplished through the use of navigational charts.

Station Fort Point Instruction 3100.3 Cont.

c. During IFR (instrument flight rules, or just plain limited visibility the operator is soley dependent on the R/Ns advisories. Accordingly, the R/N should try to keep his instructions and reports as clear and simple as possible without introducing any confusion. For example, a target which represnts a potential hazard should be reported periodically but it should be made clear that the reports concern the same target each time. An operator could be led to believe that there several closely grouped targets in front of him if the R/N were to report the same target several times without identifying it. An example of a repeated report of the same target would be: "Target reported earlier is now 20 degrees right, one quarter mile" or "Target on the left has closed to one half mile, now thirty degrees left(or still twenty degrees left)". A target which has been indentified is, of course, easier to report: "Channel bouy now 15 degrees right, one eighth mile". Not all targets should be reported. It is largely up to the R/N's discretion which targets to report and which to remain silent about. Because of the speed at which the SBRV can travel it is usually a good rule of thumb to report all targets which appear either within an area from 45 degrees left to 45 degrees right or other wise present a possible hazard to the craft. Examples of the latter would be any target which appear to be overtaking the craft from astern or any target on a collision course with the ACV.

d. The naviagtor must often give the operator instructions to execute a turn.

There are two basic methods for conducting a radar-controlled turn. The first technique is the one which trainees should adhere to prior qualification as a radar-Navigator. The Second should only be attempted after a R/N has achieved a fairly high degree of familiarity with the radar and the SBRV in general. The procedure for the former type of turn is as follows:

(1) When the navigator decides to initiate a turn he will bring his cursor line around to the desired course, determine the relative bearing of the new heading and instruct the operator to "come right 25 degrees." The operator will execute the turn by the gyro indicator and inform the navigator upon both starting the turn and completion of the turn and stabilization on the new course. This heading is maintained unless the navigator feels the need to make a further small correction.

(2) The latter form of turning consits of the Navigator instructing the operator to commence a turn, then giving a "Standby to mark" and "Mark instruction to stop the turn when the desired course is reached. The navigator must bear in mind that once he has started a turn he is in control of the craft and it wouldn't do to forget to stop the turn.

Station Fort Point Instruction 3100.3 cont.

6. Radio Communications Proceedures (a) The nature of radio communications demands more stringent standards which may be made easy by virtue of the fact that radio procedures are already well standardized within all services. There is no need for this station or its SERVs/MLBs underway to vary from these standard practices, The Standard Communications Practices are outlined in the Radiotelephone Handbook (CG 233-2).
A good working knowledge of commonly used prowords is essential for all SERV/MLB Crewmen. When initiating communications with another unit, the sending units and the receiving units call signs should be spoken twice, as well as the frequency and any other information that is inportant and brief. Example: "Coast Guard Group San Francisco, Coast Guard Group San Francisco. This is Coast Guard Hover zero one, Coast Guard Hover zero one. One Five seven decimal one. Over." Once communications have been established and are of acceptable quality, the sign call signs should be spoken only once and in most cases shortened. The following are commonly used call signs and their shorted versions: Coast Guard Group San Francisco (Group); Coast Guard San Francisco Radio (San Francisco Radio); Coast Guard Cutter Bendicoot (Bandicoot); Coast Guard 44347 (347); Coast Guard San Francisco Air (San Fran Air); etc.
(c) Prowords are words or phrases which have been assigned meanings. The following are commonly used prowords:
"OVER" End of my transmission to you and a response is required
"OUT" End of my transmission to you no response is required
"ROGER" I have received and understand your transmission.
"WILCO" I have received, understand and will comply with your transmitted request for instruction.
"FIGURES" Numerals follow.
"CORRECT" or Charlie: That is correct, or what you have transmitted is correct. Some prowords are never used in conjuction with others. For example, never say "Over and Out" or "Roger Wilco". Such phrases are only used by thimbleheaded poltrons and radiotelephonic cretins. Above all, avoid any tendency to be verbose. Transmit the information that has to be transmitted and leave it at that. Quite often radio time is at a premium. Some one else may have important traffic to transmit and is waiting while someone else stutters, stamers and listens to his own voice.
(d) All navigators should try to perform the standard predeparture checklist before leaving the ramp area:
1 Before engine start: All navigation gear aboard.
Know status of communications equipment.
Radar display unit controls nulled, power off.
Radio power off.
Clock wound / set
2 After start (generator "on"): Radar power "on" (transmit & scanner if IFR). Radio Power "on". Radio time check with Group (Group San Francisco, zero two. Request radio time check one five seven decimal one and set clock. Radio check with Fort Point / Seat belt fastened.

Station Fort Point Instruction 3100.3 Cont.

3 After leaving ramp: Advise group of underway time and destination or type of operation. Thereafter, "Operations normal" reports every thirty minutes on the hour and half hour.

7. Radar Navigators Action For Emergency Situations:

a. In the event of an in-flight emergency the navigator should immediately transmitt an appropriate message. The probability of having to send an actual MAYDAY may be very slight, but emergencies of a lesser severity do occur and Group or Fort Point must be advised immediately. Then, if conditions worsen the craft has a head start on passing the necessary information. It is important to bear in mind that the craft batteries don't last forever. In the event of an engine failure, the generator is no longer putting out and the entire electrical load falls on batteries. In such case it is imperative to save the batteries for a start. Accordingly the preliminary message would take the following form: "Coast Guard Group San Francisco, this is Hover zero one. Have experienced engine failure. Position, one half mile west of Peninsula Point. Dropping anchor, Securing electrical power and communications. Will come up on this frequency again when cause of failure is determined. Over"

b. If the situation is one which jeapordizes the safety of the craft and/or crew, this information should be passed so that preliminary rescue or assistance efforts can be started. In most cases short of a "MAYDAY", assistance will have to be requested by the SERV in question before it is undertaken. Therefore it should be determined by the crew as quickly as possible whether or not such assistance is required.

c. A Mayday message is a broadcast in the event of an accident which places a crew or craft in major danger. The Mayday should include the calling unit's call sign, position, nature of distress intentions and what type of assitance will be required. Example: "Mayday, Mayday, Mayday. This is Coast Guard Hover zero one. Position one quarter mile off Muir Beach. Craft dead in water and on fire. Crew will launch life raft. Request you send units with class Bravo Firefighting capabilities and helo to pick up crew Over".

d. Emergency check lists are contained in the crafts flight lists blue book.

W.E. WALLER

DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD

MAILING ADDRESS:
Commanding Officer
CG Station Fort Point
Presidio of San Francisco
CA 94129

1 August 1972

Coast Guard Station Fort Point Instruction 3100.4

Subj: Watertight Integrity Inspection, SERV's

1. The Air Cushion Vehicle shall be lifted and a visual inspection made of the bottom surfaces every two weeks, or whenever bottom damage is suspected. The cabin and pannier spaces should be checked at this time and made as watertight as possible.

2. All descrepancies to the bottom surfaces noted during this inspection that would in any way affect the bouyancy shall be corrected prior to conducting any over water operations.

3. To reduce the possibility of damage to the bottom bouyancy tanks, when making approaches to beach or other ground areas, if operational conditions permit, partial cushion will be maintained on the craft.

W.E. WALLER
COMMANDING OFFICER

DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD

MAILING ADDRESS:
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CA 94129

1 August 1972

ACV Unit Instruction 3100.5

Subj: ACV General Operations Proceedures; use of wet suits and exposure suits.

Purpose: The purpose of this instruction is to establish a uniform proceedure for wearing wet suits and providing anti-exposure suits on board the SK-5 SERV and MLB's.

Discussion: The importance of protecting the individual from serious injuries or possible death as a result of cold water immersion, or cold weather exposure, can not be over emphasized. Therefore, the use of wetsuits and anti-exposure suits aboard the ACV's becomes an inportant issue. This instruction sets forth the criteria governing their use.

1. Wet Suits:

General: Wet suits will be worn or carried on board for all ACV crewman for all operations.

a. Wet suits will be worn when water temperature is below 60^0F or outside air temperature is below 32^0F.

b. Since the wet suits provide sufficinet buoyancy, a life jacket is not required to be worn when working outside the cabin.

2. Anti-Exposure Suits:

Enough Anti-Exposure suits will be carried on board to provide one for each passenger. The suit will be put on whenever the integrity of the ACV becomes in doubt and the evacuation becomes neccessary. Life jackets will be worn with this suit when leaving the cabin to provide neccessary buuyancy.

Effective Date: This instruction is effective immediatly.

W.E. WALLER
Commanding Officer

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Presidio of San Francisco
CA 94129

1 August 1972

Coast Guard Station Fort Point Instruction 3100.6

Subj: SERV Emergency Check List

1. Purpose: To establish a system of Standard checks for various SERV emergency shutdown conditions on the water.

2. Discussion: The age and various design limitations of the model SK-5 SERV has prompted the neccessity for established emergency proceedures as defined in unit instruction 3100.1. To assist the SERV crew in taking appropriate and timely actions in averting more serious consequences, check lists have been developed.

3. Scope: Enclosure one, two, and three to this instruction provides emergency check lists for each SERV crewmen.

4. Action: Station operations division shall insure that copies of enclosures one two and three are conspicuously displayed in each of the assigned ACV's.

5. Effective Date: This Instruction is effective immediately.

Enclosure One: Emergency Check List SERV Operator
two: Emergency Check List SERV Radar/Navigator
Three: Emergency Check List SERV SAR Crewman

W.E. WALLER

Enclosure #1
Ft Point Instruction 3100

Subj: SERV Operator Emergency Check List

Engine or Lift Fan Failure

1. Trouble shoot cause; If able, attempt restart as soon as possible	All
2. If unable to restart, or restart attempt fails:	
A. Request Assistance	RN
B. Set Anchor	SC
C. Retrim and Dewater as necessary	ALL
D. Continue attempting repairs	ALL
E. Establish comms on a scheduled basis to conserve batteries	RN
F. Make preparations for being towed	RN/SC
3. At first signs of loss of bouyancy, or a change in craft trim:	
A. Immediately advise Base by radio	RN
B. Direct life rafts be placed on deck and secured	RN/SC
C. Attempt to dewater affected areas	ALL
D. Jettison or relocate any sandbag ballast, portable equipment and.or fuel	ALL
E. Insert padeye pins in lifting blocks	SC
4. If flooding continues, make preparations to abandon ship:	
A. Immediately advise Base of Situation	RN
B. Direct crew and passengers to don wet suits, and exposure suits, and life vests. Remove sharp objects	ALL
C. Collect all survival gear in one place and check condition	RN/SC
D. Inflate life rafts, evacuate all non-essential passengers and crew. Divide survival gear between rafts. Keep rafts secured to craft	RN/SC
E. Jettison fuel remaining in all tanks and main fuel cell	
F. Secure life ring and line to exterior of craft	SC
5. If tow arrives in time:	
A. Take radio guard for RN. Direct rescue boat to take non-essential personnel on board. Rig rafts Clear.	RN/SC
B. Tow in shallowest water possible	RN/SC
C. Or, beach to prevent loss	
6. Abandoning Ship:	
A. Without established radio comms, direct Mayday be sent on all available freqs.	RN
B. With established comms, advise Base of position freq of portable radio, and nature of signalling devices	RN
C. Check survival equipment and clothing for sharp objects	ALL
D. Insure survival, equipment is aboard rafts (OP read list RN & SC provide items)	

Enclosure #2
FT Point Insruction 3100.6

Subj: SERV Radar Navigator Emergency Check list

Engine or Lift Fan Failure

1. Establish firm radio comms. Advise them of position and situation.
2. Assist in trouble shooting difficulty, and repairs if possible
3. If unable to restart, or first restart fails:
A. Request assistance for possible tow. Establish comms schedule to conserve batteries.
B. Assist operator as directed
4. At first signs of loss of bouyancy or change in craft trim:
A. Advise Base of change in situation immediately and your intentions.
B. Don wet suit or exposure suit and life vest. Remove sharp objects.
C. Provide and check survival gear as called for by operator
D. Inflate first life raft, secure. Assit in evacuation of nonessential personnel. Devide survival gear between rafts.
E. Assit operator as directed
6. If tow arrives in time:
A. Pass radio guard to oper-ator
B. After personnel removed, secure rafts clear of towing operations
C. Rig for tow, assit as required. Take back radio guard when directed
7. Abandon Ship
A. Without radio comms established, and when directed, transmit on all emergency freqs first, the MAYDAY message(ie,who you are, where you are, what is wrong, what you intend to do, and what you want "them"to do)
B. With established radio guard, advise Base of position and abandoning ship, the freq of the life raft radio, and the nature of the signalling devices you have available.
C. Don wet suit or exposure suit and life vest
D. Remove cabin life raft, inflate and secure. Assit nonessetial personnel aboard.
E. Provide and check survival items called for by operator
F. Assit as directed
G. When directed, take charge of one life raft. Remain secured to craft as long as possible. Insure rafts tied together before casting off. Set sea anchor.

Subj: SERV SAR CREWMAN Emergency Check List

Engine or Lift Fan Failure

1. Attempt to trouble shoot difficulty, and assit in repairs if possible.
2. If unable to restart, or first restart attempt fails:
   A. Set anchor IAW ACVINST 3100.1
   B. Make preparations for being towed
   C. Assit as directed
3. At first signs of loss of bouyancy, or change in craft trim:
   A. Place pannier life raft on deck and secure. Do not inflate
   B. Insert padeye pins in lifting blocks
   C. Assit as directed
4. If flooding continues, make preparations to abondon ship:
   A. Don wet suits or exposure suit and life vest. Assit passengers. Remove sharp objects from clothing.
   B. Provide and check survival gear as called for by operator
   C. Inflate and secure second life raft. Assit in evacuation of non-essential passengers. Assit in distribution of survival gear to rafts.
   D. Secure neoprene line to life ring, and secure to exterior of craft
   E. Assit as directed.
5. If tow arrives in time:
   A. Secure empty life rings and rafts clear of towing operations
   B. Rig for and be taken in tow
   C. Assit as directed.
6. Abandon Ship
   A. Don wet suit or exposure suit and life vest. Assit passengers. Remove sharp object from clothing.
   B. Remove pannier life raft, inflate, and secure to craft.
   C. Provide and check condition of survival equipment as called for by the operator. Assit in distributing equally to rafts.
   D. Stream life ring and line overboard.
   E. When directed, secure rafts together, on board, organize and take charge of both rafts until remainder of crew abandons.
   F. Assit as directed.

DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD

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Ca. 94129

01 August 1972

Coast Guard Station Fort Point Instruction 3100.7

Subj: SERV SK-5 Operators Pre-Operations Walkaround Check List

1. Purpose: To establish a standard pre-operations check list that will insure safer and more reliable SERV operations.

2. Scope: Enclosure One to this instruction contains the list of items on the SERV and what to check for prior to each day operations. They are listed in the order that they should be checked.

3. Action: Upon assuming the SERV Ready Crew duties, the SERV operator shall conduct a complete walkaround check of the ready SERV. The walkaround check list, enclosure one, in the SERV's blue book shall be used as a guide.

4. Effective Date: This instruction is effective immediately.

W. E. WALLER

Coast Guard Station Fort Point
SERV OPERATOR's OPERATION
PRE WALKAROUND CHECK

Coast Guard Station Instruction 3100.7	
Starboard bow hatch	open
(a) Windshield washer bottle contents	fill
(b) Anchor and Line	secure
(c) Close bow hatch	secure
Operator's windshield and wiper	examine
Forward engine intake filiter	secure
Auxilliary oil-oil cap/contents	examine/secure(stbd)
HF Radio Antenna	secure
Navigation light	examine
Electrical access hatch	secure
Engine and transmission cowlings	secure/examine
Drain and vent pipes	examine
Auxilliary fuel tank cap	secure
Exhaust cover	remove
Intake filter at lift fan	examine/secure
Lift fan blades	examine
VHF antenna	examine
Nacelle support struct	examine
Propeller lashings	remove
Propeller Hub	examine
Fuel ballast tank filler cap	secure
Beacon and light	examine
Propeller Lashings	remove
Propeller Blade leading edge	examine
Nacelle support strut	examine
Intake filter at lift fan	examine/secure
Lift fan Blades	examine
Exhaust cover	remove
Engine and transmission cowlings	examine/secure
Main fuel cap	secure
Accessories access hatch	open
(a) Fire extinguishers	pins flush
(b) Fuel leaks	examine
(c) 2-fuel ballast valves	examine
(d) close hatch	secure
Oil cooler exhaust	examine
Auxilliary Fuel tank Cap	secure
Navigation Light	examine
Main oil tank cap	secure
Search Light	examine
Pitot tube cover	remove
Port windshield and wiper	examine
Center windshield and wiper	examine
Peripheral skirts	examine
Piano hinge attachements and pins	examine/secure
Peripheral skirts	examine
Piano Hinge attachments and pins	examine/secure

Coast Guard Station Fort Point Instruction 3100.7

Puffport door 1	examine
(a) skirt chains	examine
(b) skirt lift bell crank	examine
(c) puffport jacks	examine
(d) skirt lift jacks	examine
(e) Ballast Tank	examine
(f) Bouyancy tank	examine
(g) Support struts	examine
(h) Piano hinge attachments	examine
Drain	examine
Puffport door 2	open
(a) skirt chains	examine
(b) skirt lift bell crank	examine
(c) puffport jacks	examine
(d) skirt lift jacks	examine
(e) Ballast Tank	examine
(f) Bouyancy tank	examine
(g) Support struts	examine
(h) Piano hinge attachments	examine
Pannier Cover	secure
Rudder	examine
Rudder connecting rod	examine
Bushings	examine
Rudder support struts	examine
Elevators	examine
Back skirts and keel skirts	examine
Piano hinge attachments and Pins	examine/secure
Rudder	examine
Pannier Cover	secure
Puffport door 3	open
(a) skirt chains	examine
(b) Skirt lift bell crank	examine
(c) Puffport jacks	examine
(d) Skirt liftjacks	examine
(e) Ballast tank	examine
(f) Buoyancy tank	examine
(g) Support struts	examine
(h) Piano hinge attachments	examine
Drain	examine
Puffport door -4	open
(a) Skirt chains	examine
(b) Skirt lift Bell crank	examine
(c) Puffport Jacks	examine
(d) Skirt lift jacks	examine
(e) Ballast Tank	examine
(f) Buoyancy	examine
(g) Support struts	examine
(h) Piano hinge attachments and Pins	examine
Peripheral Skirts	examine
Ramp hinge attachments and pins	examine/secure

Coast Guard Station Instruction 3100.7 cont. (3)

Fire extinguisher	secure
Life Jackets	stowed
Very Pistol and ammunition	stowed
First Aid Kit	stowed
Miscellaneous equipment	stowed/secured
Back bulkhead	
(a) Auxilliary Fuel pump switch	off
(b) Auxilliary Fuel tank selectors	in
(c) Permissive switch	down/open
(d) Battery	connected
Rudder Bar	unlocked

START CHECKS:

Rudder bar and seat	adjust
Seat Belt	fasten
Circuit Breakers and switches	open/off
Controls	free
Radio, ADF, radar and electronics	off

START PROCEDURES:

Low pressure fuel cock	down/open
AC circuit breaker	open
Throttle	Closed
External power	as required
Battery switch	on
Igniter switch (test for audible)	on
Fire Test	press to test
Control Power	on
Main Pressure on oil and AC power	
Failure light	on
Fuel pump switch	on
CHECK ALL CLEAR TO START	
Starter switch	actuate

Operate to the start position and hold until gas gnerator reaches idle speed. (This switch is spring loaded and will return to neutral position when released. The engine should stabilize at an idle gas generator speed of 55% - 60% RPM. The ed of the power turbine will depend on the load. (propeller ch).

Generator switch	on
AC circuit breaker	closed
Main engine, engine oil pressure and AC failure lights	out
Engine oil pressure	25-60 PSI
External power(when used)	disconnected
Beacon	on
Nav Lights	on

NOTE: Allow three minutes for thestarter to cool before attempting another start.

Shutdown Proceedures

Throttle	closed (gas gen 54 to 60%)
Propeller Pitch	Zero
AC inverter circuit breaker	open
Stop button	push
Control power	off
Fuel Pump	off
Nav & Beacon Light	off
Generator	off (before battery)
Battery	off
Seat Belt	store
Disconnect Aux Battery	

DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD

MAILING ADDRESS:
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CG Station Fort Point
Presidio San Francisco
Ca. 94129

26 October 1972

Coast Guard Station Fort Point Instruction 3100.8

Subj: SERV Operating Proceedures Through and Near Bridges

1. Purpose: To establish safe operating proceedures for SERV's when operating near or through bridges.

2. Discussion: Whenever SERV operations require maneuvering near fixed objects or through bridge spans, the angle and speed of approach of the SERV is often very deceptive. Experience has shown that this deception has caused dangerous near misses to occur . For this reason a set of standard proceedures have been developed to aid the SERV operator in minimizing the potentially hazardous operational conditions.

3. Action: All SERV operators will apply the standards set forth in this instruction whenever craft operations dictates.

a. SERV Operations Near or Through Bridges

(1) Whenever possible, the operator shall select the main span as soon as is feasible for transit through the bridge.

(2) While enroute, the operator should begin neading for the main span as soon as is feasible.

(3) The operator and radar/navigator should be continuously scanning from port beam to starboard beam for other traffic and stationary objects for determining the crafts set and approach angle.

(4) Glassy calm water conditions are deceptive. Speed and distance are often to difficult to determine. SLOW DOWN.

(5) Do not attempt to cut corners. Each transit through the bridge should be made from an approach which was begun on a line perpendicular to the bridge span.

(6) Line up on the span should be begun as soon as practical, always allowing sufficent time to plan transit, slow down and get the craft lined up.

(7) When in doubt, STOP.

CG Sta Ft Pt Inst. 3100.8 (continued)

(8) Proper coordination of controls is important to good operation. In a normal slowing of the craft the operator should first retard throttle followed by returning the porpeller pitch lever to approximately 5° reverse propeller pitch. It will further aid in stopping the craft if the operator will use his puff port "all switch" opening and closing the doors intermittingly.

(9) With the exception of the Golden Gate, San Francisco Bay and Richmond/San Rafael Bridges the craft should be operated through the bridges with approximately 70% power turbine and 10-15° of propeller pitch.

(10) The bridges in the Oakland Inner Harbor should be transited with approximately 45-50% on the power turbine and 7-12° of propeller pitch.

(11) When operating through a bridge against a tide or current, the operator may find that the craft will not make way with power/pitch settings lower than those recommended above.

(12) Speed, distance, and actual craft movement are difficult to determine during the hours of darkness. The operator should ensure that craft speed does not exceed that which would allow an object to be sighted and thensafely avoided by turning or stopping.

(13) Water spray on the windows reduces visibility and leads to continuous wiper operation. Spray can be reduced considerably by either retarding the throttle or increasing the propeller pitch. In some situations where the craft trim is not critical, the elevator control lever placed in the down position will also aid in reducing spray.

4. <u>San Francisco Bay - Area Bridges</u>

a. Fort Point Station - West
(1) Golden Gate Bridge. (minimum vertical clearance 211')

b. Fort Point Station - South
(1) San Francisco Bay Bridge - West Span. (main span vertical clearance 204')
(2) San Francisco Bay Bridge - East Span. (main span vertical clearance 141')
(3) San Mateo/Hayward Bridge. (main span vert. clear. 135')
(4) Dumbarton Railroad Swing Bridge. (main span vertical clearance 13')
(5) Dumbarton Vertical Lift Bridge. (main span vertical clearance 9')

CG Sta Ft Pt Inst. 3100.8 (continued)

c. Oakland Inner Harbor - Government Island (approach through North entrance.
(1) Dennisson St. fixed bridge. (no acces through this bridge for the ACV)
(2) Park St. lift bridge. (main vert. clear. 15')
(3) Fruitvale Ave. Railroad lift bridge. (main span vertical clearance 13')
(4) Fruitvale Ave. swing bridge. (main span vertical clearance 6')
(5) High St. Bridge. (main span vert. clear. 16')

d. San Leandro Bay Entrance
(1) Bay Farm Bridge. (main span vert. clear. 20')

e. Fort Point Station North
(1) Richmond/San Rafael Bridge East Span. (main span vertical clearance 135')
(2) Richmond/San Rafael Bridge West Span/ (main span vertical clearance 185')
(3) Carquinez Strait fixed bridge North span (main span vertical clearance 144')
(4) Carquinez Strait fixed bridge South span (main span vertical clearance 134')
(5) Suisun Point fixed bridge (main span vert. clear. 135')
(6) Southern Pacific lift bridge. (main span vertical clearance 70')

5. Overall Clearance Height Requirement for the Coast Guard SERV SK-5
a. Craft on cushion with HF antenna mast up. (26' minimum)
b. Craft on cushion with HF antenna mast down. (17' Minimum)
c. Craft off cushion with HF antenna mast up. (22' minimum)
d. Craft off cushion with HF antenna mast down. (13' minimum)

W. E. WALLER

DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD

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Presidio San Francisco
Ca. 94129

26 October 1972

Coast Guard Station Fort Point Instruction 3100.9

Subj: SERV SK-5 Passenger Briefing, requirements for

1. Purpose: To establish a standard passenger briefing format for use aboard SERV;s.

2. Discussion: The Commandant requires that all passengers riding aboard a SERV be briefed on SERV's emergency proceedures prior to getting underway.

3. Action: Whenever SERV operations require the carrying of passengers, military or civilian, the SERV operator shall insure that the passenger(s) are properly briefed on the below listed items:

(a) Use of seat belts.

(b) Location and wearing of life jackets.

(c) Location and type of Life Raft.

(d) Emergency exit proceedures.

4. Effective Date: This instruction is effective immediately.

W. E. Waller
W. E. WALLER

DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD

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Ca. 94129

3100.10
27 October 1972

Coast Guard Station Fort Point Instruction 3100.10

Subj: SERV SK-5 SAR Equipment Allowance/Location Check List; establish of

1. Purpose: To establish a standardized equipment allowance and stowage listing for use aboard SERV assigned to this unit. Also, to provide a means for proper maintence of the equipment.

2. Scope: Experience has shown that the SAR equipment listed in enclosure one to this instruction, is essential in order to properly carry out the SERV;s assigned tasks. Therefore, the security and proper maintenance of this material cannot be overemphasized.

3. Action: SERV craft captains shall be responsible for the proper maintenance and location of all SAR equipment contained in enclosure one. This equipment will be checked daily by the assigned craft captain, using enclosure one as a check list. In the event that some equipment in missing or not functioning properly the craft captain shall take the appropriate actions to repair or procure replacements. These equipment checks shall be made prior to 0800 and all descrepancies reported to the appropriate section leader.

4. Effective Date: This instruction is effective immediately.

W. E. WALLER

COAST GUARD STATION FORT POINT
SAR SERV EQUIPMENT CHECK
LIST

NOTE: EQUIPMENT IS TO BE CHECKED DAILY, BY CRAFT CAPTAIN AND CRAFT CHECK LIST WILL BE SIGNED AND TURNED IN TO ENGINEERING.

DESCRIPTION	AMOUNT	LOCATION
Life preservers	9 each	Under sears Aft/Bulkhead.
Life Ring	1 each	200' Poly Prop Line Pt "
Work Jackets (Life)	4 each	Aft Bulhead Shelves
MK 7 Life Raft, Rubber	2 each	Port Pannier/Cabin
Mirror Signal MK-3	1 each	Nav Pouch
Harness Safety Swimmer	1 each	SAR Box
Tending Line Swimmer	50 Feet	SAR Box
Whistle, Ball	2 each	1 SAR Box, 1 Nav Bag
Horn, Manual, Fog	1 each	SAR Box
Horn, Manual, Fog Spare	1 each	SAR Box
Binoculars	1 each	Back of Seat
Flashlight 2 Cell	1 each	Nav Bag
Battery D cell	2 each	Tool Box
Signal Light, Very Service	1 each	SAR Box
Signal Smoke, Illumination Dist	12 each	SAR Box
Signal Kit MK-79	1 each	SAR Box
Parrell Rule	1 each	NAV BAG
Area Charts	1 each	NAV BAG
Nav Instrument Kit	1 each	NAV BAG
Tide Current Table	1 each	NAV BAG
SK-5 Op/Maint Manual	1 each	Plastic Bag -AFT Bulkhd
Nautical Slide Rule	1 each	NAV BAG
Pencils, Pen	3 each	NAV BAG
First Aid Kit	1 each	Mounted on Bulkhead Stb
Hook, Boat 8FT	1 each	Mounted on Stb. Walkway
Grapnel, Marine WT 4 lbs	1 each	Starbd Bow Compt
Budy Jumper Cable	1 each	Starboard Pannier
Tow Bridle	1 each	Tow Line Box
Tow 200 FT Poly Propalene	1 each	Starboard Pannier
Anchor 200 ft Line	1 each	Starboard Pannier
Mooring Line	3 each	Tow Line Box
Fire Extinguisher	1 each	Mounted AFT Bulkhead Shelve
Extinguisher Dry Chemical	1 each	Cabin

Tab C-11-B

DESCRIPTION	AMOUNT	LOCATION
Chamois	1 each	Radar Support
Operator Check list	1 each	Nav Bag
SAR Folder and Log	1 each	Radar Nav Sear
Tool Box	1 each	Mounted on Deck, Op Seat
Lube Oil	6 Qts	Under Radar Seat
SAR Box	1 each	Mounted on Deck
Blanket	1 each	SAR Box
Fuses, Spare	Mis	SAR BOX
Kapok Heaving Line	1 each	Tow Line Box
Signal Kit	2 each	SAR BOX
Knee Board	1 each	NAV BAG
Hatchet	1 each	SAR BOX
Light, Hand	1 each	SAR BOX
Hand Bilge Pump	1 each	SAR BOX
Homelite Pump	1 each	Starboard Bow Compartment
FWZ Pump Suction	1 each	SAR BOX
Line Adapter	1 each	SAR BOX
Cabin Bilge Pump	1 each	AFT Bulhead by Bilge Pump
Aux Hose	1 each	AFT Bulkhead by BilgePump
CG Station Fort Point, ACV OP/INST	1 set	NAV Bag

DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD

MAILING ADDRESS:
Commanding Officer
CG Station Fort Point
Presidio of San Francisco
CA 94129

1 August 1972

Coast Guard Station Fort Point Instruction 3120

Subj: Air Cushion Vehicles handling and servicing; instructions concerning

1. Purpose: To set forth certain instructions for the starting, maneuvering, handling and servicing of the SK-5 ACV.

2. Proceedures: The following procedures will be observed concerning the ACV's at this unit:

a Starting and run-up precautions

(1) Only personnel qualified to conduct pre-flights and post-flight inspections or students under qualifies supervision, shall be authorized to start the craft.

(2) Only qualified operators, or students under qualified supervision, shall start the craft for purposes of operation.

(3) For power run ups, tether lines shall be rigged in accordance with the SK-5 operating and maintenance manual. They shall also be used for purposes of maneuvering whenver ramp congestion or wind conditions dictate.

(4) Prior to starting the engine, one person shall act as a ground controller and safety observer. One person shall be stationed near the craft with an adequately charged fire extinguisher during the start sequence. All signals between the operator and controller shallbe made and acknowledged by each prior to the action being initiated.

(5) All personnel in the area shall wear sound suppressor head sets or ear defenders.

b. All Maneuvering on the ramp shall be under the direction of the ground controller. He shall use the standard hand signals in accordance with enclosure (1); and parking of the craft shall be in accordance with enclosures (2) of this instruction.

c. Because of the explosive nature of fuels, the lethal nature of vapors, and the toxic action upon skin and eyes, careful handling and struct safety precautions must be rigidly observed.

Coast Guard Station Fort Point Instruction 3120. Cont.

The following is but a representative list of some of the precautions which must be absolutely adhered to:

(1) No smoking within 50 feet of the ACV's and/or fuel trucks, nor within 100 feet of any fueling operation.

(2) Park fuel truck up wind of fueling operation.

(3) Park truck parallel to the craft. Never back up towards it.

(4) Fueling or defueling is prohibited in the hanger.

(5) Both the Fuel truck and the craft shall be adequately grounded; and the fuel hose shall be grounded to the craft itself prior to commencing the fueling.

(6) Fueling shall not be conducted within 300 feet of an operating radar antenna.

(7) Do not energize switches, radios, or connect or disconnect batteries during fueling.

(8) Fuel soaked clothing should be removed as soon as possible, and affected areas of skin washed thoroughly with soap and water. Shower facilities are available in the hanger and station building.

(9) Clean up fuel spills immediately, and wash thoroughly with plenty of water.

(10) Avoid Breathing fuel vapors. If dizziness occurs, get victim to fresh air immediately and summon medical assistance.

(11) At night, use only explosive proof flashlights or extension lights.

(12) Fuel leaks in equipment shall be reported immediately, and no further operations with the faulty equipment is permitted until repaired.

d. Travelift Operation: Only qualified personnel, or students under qualified supervision, shall operate the travelift. The following precautions shall be observed:

(1) Inspect the travelift for general conditions, tires for cuts and proper inflation, engine for condition and proper oil level, and cables and blocks for any obviously dangerous condition.

(2) For operation, one person shall act as the operator, and the other person on the ground shall act as the controller and safety observer. He shall situate himself so as to be visible

Coast Guard Station Fort Point Instruction 3120 cont.

at all times by the operator and also be in a position to observe the blind areas for the operator.

(3) After starting the engine, check all controls and devices for proper operation and response.

(4) Sound horn prior to moving the travelift.

3. Effective Date: This instruction is effective immediately.

W.E. WALLER
Commanding Officer

DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD

MAILING ADDRESS:
Commanding Officer
CG Station Fort Point
Presidio of San Francisco
California 94129

1 August 1972

Fort Point Instruction 3500.1

Subj: ACV/MLB training and designation; procedures for

1. Purpose: To prescribe the requirements for individual training and designation in the SK-5 Air Cushion Vehicle.

2. Discussion: It is the intentions of the unit that each person assigned shall be given the opportunity to advance himself to the highest qualification consistent with operational commitments and needs of the unit. Therefore every person reporting in shall be issued a training jacket to assist him in his advancement efforts. The rate of this advancement shall be the responsibility primarily of the individual himself. He shall be assisted in obtaining some of the required lectures and syllabus training by scheduled training sessions on the Daily Operations Schedule. Upon completion of a syllabus, the operations section shall verify that the requirements are met, and will initiate a letter of qualification and certificate of qualification will be presented with appropriate ceremony. When applicable, enlisted qualifications code designations will be submitted to the Commandnat for entry in the service record, for the Air Cushion Vehicle.

3. Description: The ACV training program is devided into two phases:

a. Phase I: Phase I of the ACV ground school. The syllabus consists of approximately 40 hours of indoctrination in ACV principles of operation and the SK-5 systems. An examination shall be administered and satisfactorily completed prior to advancing to Phase II.

b. Phase II: Phase II is considered as the qualifications course, which shall advance the trainee towards his ultimate goal of ACV operator. The three stages of advancement in phase II are commensurate with proficiency and experience gained in the craft. These stages are defined as:

(1) ACV SAR Crewman: For designation the following requirements shall be met:
   (a) Have a satisfactorily completed SAR Crewman syllabus
   (b) Have a minimum of 10 hours in the craft, of which:
      1 2 hours must be operator time

      2 2 hours must be at night

Fort Point Station Instruction 3500.1 cont.

2. ACV Radar Navigator: For designation, the following requirements shall be met:

(a) be a designated SAR ACV Crewman

(b) have satisfactorily completed the Radar Navigator syllabus

(c) satisfactorily complete a day and night check ride

(d) have a minimum of 25 hours in the craft, of which:

1. 4 hours must be operator time

2. 15 hours must be radar time of which 4 hours must be at night.

3. ACV Operator: Fore designation, the following requirements shall be met:

(a) be a designated Radar Navigator

(b) have satisfactorily completed the operators training syllabus

(c) satisfactorily complete a standardization check ride

(d) have a minimum of 50 hours operator time, of which 6 must be at night.

4. Action:

(a) Training Jackets: Training Jackets will be made up and issued by the administration section to the newley arriving personnel. The trainee will be individually responsible for having designated instructors sign off syllabus items upon satisfactory completion of a syllabus, operations will initiate the required forms for designation.

(b) Syllabus: The operations sections shall be responsible for keeping the various syllabi current, and revising them to adequately describe the requirements and qualify trainees for thier positions in the craft.

(c) Instructors: A list of those persons qualified to instruct syllabus lessons and to sign off items upon satisfactory completion shall be promulgated as required by Unit Notice 1410 series.

5.

Fort Point Station Instruction 3500.1 cont.

5. Training: The training requirements for crew designation for MLB's shall be governed by the requirements of the Small Boat Training Program, CG 313 as it applies to Coxn, Engineers and SAR Crewmen. Personnel completing the requirements of CG 313 will be designated by letter.

W.E. WALLER
COMMANDING OFFICER

DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD

MAILING ADDRESS:
Commanding Officer
CG Station Fort Point
Presidio of San Francisco
CA 94129

1 August 1972

Coast Guard Station Fort Point Instruction 9820

Subj: One Hundred hour maintenance checks for SERV SK-5

1. Purpose: To establish a standard maintenance schedule for model SK-5 ACVs that gives the extent, frequency, and sequence of the minimum routine servicing considered necessary to maintain the G.E. LM-100 turbine engine, SK-5 support/auxiliary systems, and SK-5 Electrical/Electronics Systems.

2. Action: (a) The Engineering department shall schedule the maintenance check for each of the SERVs assigned to this unit so as to not exceed the 100 hour limit or six weeks of continous operation.
(b) The check list contained as enclosures to this instruction shall be used when conducting the check. The enclosed check list are as follows:

(1) SERV Craft/Hull 100 inspection

(2) GE LM-100 Engine 100 hour Inspection

(3) SK-5 Electrical and Instrument 100 hour Inspection

3. Effective Date: This Instruction is effective immediately.

W.E. WALLER
Commanding Officer

Coast Guard Station Fort Point
GE LM100 ENGINE
100 HOUR INSPECTION

Item No.	Operation	Cfaft Hrs.	Signature
1	Engine Run-Down Check Check the engine run-down time, and at the same time listen carefully for any unusual engine noises. The run-down time from 17,000 c.r.p.m. should be between 48 and 60 seconds.		
2	Air Intake Front Frame Inlet Guide Vanes 1st Stage Rotor Blades Examine for erosion.		
3	Inlet Guide Vanes and Variable Stator Blades (1) Blade Link Work (2) Actuating Levers and Actuating Rings (3) Pivot Pins (Actuating Mountings) Examine for security, cleanliness and corrosion particularly the actuating levers and pins. Coat the items lightly with engine oil. (NOT IF SAND IS PRESENT)		
4	Engine Throttle Control (1) Functionally test and check for freedom of movement. Ensure that the throttle comes back to the minimum flow stop on the engine. Lubricate all pivots with clean engine oil. (2) Examine the bell-crank in the engine compartment for security, wear and distortion. (3) Lubricate the bell-crank with grease.		
5	Emergency Fuel Shut-Off Cock Ensure that all joints are locked and that the operating rod has a clear run.		

Item No.	Operation	Craft Hrs.	Signature
6	Magnetic Plugs Remove the three magnetic plugs in the engine oil system. The plugs are located on the underside of the accessory drive casing, under the bevel gearbox, and the scavenge return from No. 3 bearing. Examine thepplugs. If metal particles are found retain the particles, for investigation, by washing and filtering. Run the engine for 15 min. and them check again. If metal is still being deposited deposited change the engine.		
7	Oil Filter Element Remove and examine the element. If found satisfactory clean and refit. If metal particles are found proceed as in the previous operation.		
8	Engine Washing Spray Ring Check and clean spray holes. Ensure that the spray ring holes are aligned with the holes in the air intake.		
9	Exhaust Casings, External/Internal Blade Guards and Extension Pipe Examine for hot spots, cracks, and signs of gas leakage.		
10	Combustion Chamber Outer Casing Examine for serious corrosion, gas leaks, hot spots and distortion.		
11	Turbine Casings (Stages 1 and 2) Examine for hot spots, cracks and signs of leakage.		
12	Fuel, Oil and Air Pipes Examine for chafing, corrosion and secutity of bonding and locking.		
13	Front Frame: Remove the debris guard, starter bullet and starter. Examine for oil leaks around the starter jaw i in the front frame. If found satisfactory, refit the starter, bullet and debris guard.		

Item No.	Operation	Craft Hrs.	Signature
14	*Fire Shield* *Examine for corrosion, dents and buckling.*		

U.S. COAST GUARD STATION FORT POINT

SERV CRAFT 100 HOUR INSPECTION

ITEM NO.	OPERATION	SAT	UN-SAT	INITIALS
1.	GENERAL CRAFT Lift the craft and place stands under the landing pads (2) Hose down the craft with fresh water, including the craft undersurface, to remove all dirt and salt deposits (3) Examine the external structure for damage, corrosion, distortion cracks and loose rivets. Include the under surface of the craft, especially areas normally covered by the flexible trunks, and the under surface of the cabin area for delamination. Plasticell blocks for wear and security (4) Examine the landing pads for damage of the electrical bonding. (5) Examine the condition of the surface finish. Remove any corrosion and restore the protective finish as necessary.			
2.	PLENUM CHAMBER FLEXIBLE TRUNKS Clean and examine the outer trunks, keel, lateral trunks and fingers. for damage, security of attachment and wear of the hinges. Remove hinge pins as necessary and check the lifting chains and chain attachments for security and wear. Renew worn hinge bushes			
3.	PLENUM CHAMBER SUPPORT STRUTS AND TUBES Examine for damage, corrosion and security of attachment. Remove any corrosion and restore the protective treatment. If Mod. N5/343 (steel struts) is not embodied, restore the protective strips as necessary.			

ITEM NO.	OPERATION	Sat.	Disc. No.	Initials
4.	SIDE DECK STRUCTURE From within the plenum chamber examine the sidedecknstructure for damage damage and corrosion, particularly the boundary members and bracing tubes visually for cracks.			
5.	RUDDER AND ELEVATOR CONTROLS IN PLENUM CHAMBER Clean and examine the cables, pulleys and fairleads. Should evidence of cable wear be apparent, e.g., flatenning or shiny appearance, disconnect the cable and twist it, by hand, against the lay, and examine for internal fraying. Fit a new cable, if necessary. Reconnect and lock the cable. Check the control setting.			
6	BALLAST SYSTEM (1) Examine the forward and aft ballast tanks, pipes and components for damage, leaks and corrosion. Check the tanks for water, using a bilge pump. (2) Empty the pallast pump gland drain canisters (forward and aft) (3) Transfer fuel to main system			
7.	BUOYANCY TANKS (1) Examine for damage, corrosion and the Redux bonds for signs of deterioration. (2) Drain, either by using a bilge pump or removing the drain plugs. When refitting the plugs coat them with grease			

ITEM NO.	OPERATION	SAT	DISC. NO.	INITIALS
8	BUOYANCY TANK UPPER AND LOWER ATTACHMENT FITTINGS Clean and examine for cracks and corrosion			
9	FIN SUPPORT STRUCTURE Examine for damage and corrosion. Drain by removing the drain plugs. When refitting the plug coat it with grease.			
10.	CONTROL LEVER AT COMPARTMENT AT BASE OF STARBOARD FIN Remove end of aft trunk below starboard fin. Open inspection panels and check compartment and controls for sand, dirt and corrosion. Ensure that tooling holes are plugged and corners sealed with PRC. Apply grease lubriplate liberally to rod end bearings. Refit inspectio inspection panel, ensureing good fit and seals serviceable. Refit trunk.			
11.	CABIN (RAMP, ENTRANCE AND DOOR) Examine thoroughly for cracks and corrosion and condition of seals. Check the safety walk covering for wear and security of attachments. Check the door locks and door counter balance mechanism for correct adjustment			
12,	CABIN STRUCTURE AND TRIM Check the cabin for internal structure for damage and corrosion and the trim for deterioration			
13.	Examine for wear and remove any corrosion. Restore protective treatment as necessary. Lubricate the top sockets of the wiper arms with Lubriplate, and other joints with oil, MIL-L-7870. Do not lubricate the wiper spindle nylon bushings.			

ITEM NO.	OPERATION	SAT	DISC. NO.	INITIALS
14	WINDSCREEN WASHING SYSTEM Check the Screenjet unit, pipes and jet tubes for damage, security, and leaks			
15.	CONTROLS IN THE CABIN (1) Check the propeller pitch and throttle controls for full and free movement and wear. Check the lever and twist grip for security and wear, and correct operation. (2) Check the rudder bar, connecting rods and cross shafts for full and free movement, security and wear, Lubricate. (3) Check the rudder bar adjusting mechanism for operation and lubricate. (4) Check the elevator lever for operation. Examine the quadrant for wear and lubricate. (5) Lubricate teleflex swivel unions, using grease. (6) Check the L.P. cock for operation			
16	SEATS AND LIFEJACKETS (1) Examine seats and harnesses for damage, wear and security. (2) Check lifejackets for damage and wear			
17	SIDE DECKS AND CABIN EXTERIOR Clean and check craft slinging fittings visually for cracks and coat with grease			
18.	RADAR SCANNER Examine for damage and wear			
19.	LIFERAFTS Check as far as possible, without removing it from stowage. Ensure that the lanyard is attached to the craft structure. Check if it is due for overhaul.			

ITEM NO.	OPERATION	SAT	DISC NO.	INITIALS
20	FREIGHT PANNIERS (1) Examine the compartments and lids for damage and dorrosion, and the seals for deterioration. Check the hinges for cracks and the lid support stays for correct o operation. Lubricate the locks and hinges using oil.			
21.	MAIN FUEL SYSTEM Examine all fuel components and pipelines in the port accessories bay for damage, security, dents, corrosion and leaks, Check the condition of the filler cap seal.			
@@. 22.	OIL SYSTEM (1) Examine the oil coller for damage, security and leaks. Ensure that the air passages are free from corrosion and salt deposits. (2) Examine the oil tank and pipelines for damage,			
23.	leaks and security. Ensure that the tank vent is clear, and examine the condition of all pipeline connections, particularly the Liflex couplings. NOTE: The oil is to be changed at 1,250 hour intervals i.e. when an engine is changed			
23	THROTTLE CONTROL IN ENGINE COMPARTMENT Examine for damage, wear, distortion and security, particularly the bell crank lever.			
24.	PROPELLER PITCH CONTROL (Pre Mod, N5/540) Check tightness of spring damper strut fork-end lock nuts. Tighten if loose and check control settings. Refer to book 2 (Post Mod. N5/541) Lubricate linkage with grease.			
25	ENGINE AND GEARBOX MOUNTING STRUCTURE (1) Examine for damgae, cracks, and corrosion (2) Lubricate at grease nipples using grease.			
26	BARREL GEAR COUPLINGS (GEARBOX COUPLING SHAFT AND FAN DRIVE SHAFT Remove the filler plugs and check the oil level. If the level is low, check the gearbox for internal and external leaks. If the leak is external, remove the shafts and clean off the sealant. Assembe the joints and reseal the plugs in the shaft with a fillantof PR 1221 sealant for internal leaks. Replenish oil as necessary. If leaks occur at the oil seal, refer to the workshop manual			

ITEM NO.	OPERATION	SAT	DISC NO.	INITIAL
27	#1 GEARBOX Examine the gearbox for oil leaks. Clean			
28	OMIT			
29	#2 Gearbox AND NACELLE (1)Examine the gearbox for oil leaks, clean. (2) Remove the side inspection covers from the gearbox to obtain access to the spiral bevel pinion on the mainshaft. (3) Using a flashlight examine for signs of the follwoing defects: (a)Impact damage or scuffing at the roots of the pinion teeth at the tips of the bevel wheel teeth both towards the toes of the teeth (b) Traces of metal feathering or slight burring of the bevel collar (Mod N5/455) or bevel cone (pst Mod.) where it has been running against the bearing. A small mirror is necessary for this examination. (c) Any separation between the pinion flange and the shaft flange on the mainshaft. If a gap, between the pinion nose register and the flange becomes tactable with a .002" feeler gague, or if the oil is squeezed from between the abutting faces when the propeller is turned backwards and forwards by hand, then slackness is indicated. As soon as possible, and before the gap has increased to .010", the gearbox must be stripped for inspection. A maximum gap of .004" is permitted for engine running at the maximum power necessary to return the craft to a servicing base. NOTE: If it necessary to tighten the mainshaft rear nut, proceed as follows: (i) Suitably support #2 gearbox (ii) Remove propeller, refer to op's manual (iii) remove nacelle and both nacelle support struts (iv) Locate the rear nut on the mainshaft on #2 gearbox. Reassemble the nut on the shaft. Use loctite(Lock nut) and torque the nut on the shaft to 280'lbs ± 20'lbs. Use a new tab washer (v) Refit the nacelle support struts and propeller			
30.	NACELLE SUPPORT STRUTS Lubricate with grease, AERO SHELL 14			

ITEM NO.	OPERATION	SAT	DISC NO	INITIAL
31	LIFT FAN (1) Examine the discs and blades for damage, security, loose rivets and distortion. Renew the foil (on protection strips as necessary). Insure that the blade and disc drain holes are clear. (2) Check hum attachment bolts and fittings for security (3) Check fan intake ducts for damage, loose rivets, corrosion, etc.			
32	TAIL UNIT FINS AND MOUNTING STRUCTURE Examine for cracks, corrosion, loose rivets and distortion. Restore the surface finish as necessary.			
33.	TAIL UNIT RUDDER AND ELEVATOR CONTROLS (1) Check the rods and louvres for damage, distortion and security. Lubricate rod and bearings liberally with Lubriplate. (2) Examine the control rubber protectors for deterioration and security.			
34.	RUDDERS AND ELEVATORS (1) Examine the control surfaces for damage, distortion and the hinges for wear. Restore surface finish as necessary. (2) Lubricate the hinges and rod end bearings using grease liberally to protect against corrosion (3) Examine the rudder interconnecting control rod for corrosion and the rod ends for wear. Lubricate liberally with grease. (AERO SHELL 14)			
35.	OVERLOAD FUEL TANKS Fuel pump and associated wiring. Examine for damage security and corrosion.			
36.	PROPELLER BLADES Mod. N5/534 Polyeurethane coatings on blades for damage. Any damage penetrating the coating must be repaired. See the workshop manual			
37.	ENGINE FILTERS Remove, clean and replace			

ITEM NO.	OPERATION	SAT	DISC NO.	INITIALS
38	CABIN FLOOR Examine for damage, corrosion and signs of delamination of the upper skin, particularly at the seat attachment points.			
39	HAND FIRE EXTINGUISHERS (1) Check the overhaul period. If the extinguishers are not due for overhaul, check by weighing. The weight must be within 1oz of that stamped on the operating head (2) Fit serviceable extinguishers			
40.	ENGINE/ACCESSORY COMPARTMENTS, TRANSMISSION AND SYSTEMS (1) Main Fuel System (a) Drain any accumulated water from the filter by unscrewing the smaller of the two nuts (drain plug) below the filter bowl. Refit the nut. (b) Drain any accumulated water from the fuel tank by conneeting a bilge pump, with a ¼" B.S.P. connection to the drain connection in the port accessories bay. Refit the blanking plug. If water is found bleed the fuel L.P, and H.P, systems and run the engine.			
41.	ENGINE FIRE EXTINGUISHER SYSTEM (1) Remove the blanking caps from the servicing connections for the zone 1 and zone 2 spray pipes and blow through with dry air at a pressure of 50psi. Refit the blanking caps. (2) Check life of extinguishers			
42.	THROTTLE CONTROL IN ENGINE COMPARTMENT (1) Lubricate using grease, (2) Lubricate throttle control Teleflex control using oil			
43	Number one GEARBOX Remove the magnetic filter and examine it for metal particles. If metal is found investigate. Examine the magnetic filter at the next three post checks.			
44.	NACELLE SUPPORT STRUTS Check the end fittings for corrosion and wear			
45.	LIFT FAN Lubricate the top and bottom fan bearings with grease AERO SHELL 14			
46	FINS AND MOUNTING STRUCTURE Examine the fan attachment fitting for damage, corrosion and security			

ITEM NO.	OPERATION	SAT	DISC NO	INITIALS
47	SKIRT LIFTING GEAR Check all hydraulic jacks and lines for leaks			
48	RUDDER AND ELEVATOR CONTROLS Check that the control cable tension is between 100lbs and 120lbs. Check tension at points between fairleads, use a S.M.E. MK 5 cable tensiometer.			
49	CABIN STRUCTURE AND TRIM Remove the cabin trim at selected places and examine the structure for corrosion, especially around outer buoyancy tank attachment points.			
50	CRAFT SLINGING FITTINGS Clean and check for cracks using a dye penetrant test			
51.	FREIGHT PANNIERS Clean and inspect			
52.	OIL SYSTEM (each even inspection) Renew the element in the purolator filter (refer to Op'r handbook). Examine the old element for any metal particles. If any are found, investigate the cause.			
53	ENGINE ZONE 2 COOLING AIR FILTER Renew the filter frams (more frequently in adverse cond.)			
54.	ENGINE AND GEARBOX MOUNTING STRUCTURE Examine for damage, cracks and corrosion			
55.	BARREL COUPLINGS Drain the oil from the couplings and examine it for metal particles. If metal particles are found dismantle the coupling for examination. Refill the coupling with oil SHELL EP 140. Dismantle the couplings and examine the gear teeth for damage and wear. Examine the female coupling flanges and the shaft ends for cracks using a crack detector. Assemble the couplings and fill with oil.			
56.	NO. 1 GEARBOX Clean the oil jets. Refit (refer to Op'r handbook). This operation should be supervised to ensure cleanliness and correct assembly.			
57.	No. 2 GEARBOX Same as 56, #1 gearbox			
58	NACELLE The external oil pipe on No. 2 gearbox and the nacelle is attached by two banjo bolts. The aft banjo bolt embodies a restrictor. Remove the aft banjo bolt and clean the restrictor. Ensure banjo bolt w/restrictor is refitted in aft portion. This operation should be supervised.			

ITEM NO.	OPERATION	SAT	DISC NO.	INITIALS
59	SKIRT LIFT GEAR Clean the hydraulic jack ventnear filters.			
60	PUFF PORT VALVE SYSTEM (1) Check hydraulic jacks for leaks (2) Clean hydraulic jack vent mesh filters			
61	ENGINE FIRE EXTINGUISHER SYSTEM Check the extinguisher bottles for overhaul Same as #41.			
62.	LIFT FAN Rotate fan manually to check for smooth operation			

Coast Guard Station Fort Point
SK 5 - Radar and Radio
100 Hr. Inspection

Item Nor.	Operation	Craft Hrs.	Signature
1.	Radar Remove the scanner motor belt cover and remoce the driveing belt from the motor shaft pulley. Remove the scanner motor cover. Blow out any carbon dust and clean the commutator, using a clean, dry, lint-less cloth. If necessary the cloth may be moistened with Trichlorethane. Switch on the scanner motor and ensure that there is no excessive sparking at the commutator and brushes. Refit the motor cover, belt and belt cover. Ensure that the motor cover is correctly seated on its rubber gasket.		
2.	Radio All Equipment Check for cleanlines, condition and security.		
3.	Plug/Socket Connectors Check for cleanliness, condition and security. All Cables and Wiring Check for cleanliness, condition and security of clipping. Co-Axial Aerial and Feeder Check, especially for breaks in the starboard run.		
4.	Radar All Equipment and Wiring Check for cleanliness, security, condition and signs of damage.		
5.	Intercom (If fitted) Functionally test. Transmitters and Receivers Functionally test.		

Coast Guard Station Fort Point
SK/5 - Electrical and Instruments
100 Hour Inspection

Item No.	Operation	Craft Hr.	Signature
1.	Battery (1) Clean and inspect. Check the level of electrolyte in each cell. The correct level is 13 mm. above the separator guards. Top up with distilled water only. (2) Examine for sighs ofelectrolyte leakage, and corrsion. If corrosion is found sponge the affected parts with a saturated solution of water and bicarbonate of soda, and rinse with clean vater. Ensure that none of the solution enters any of the cells or serious damage will result. (3) Note: Remove every 200 Hrs and cycle all batteries.		
2.	Fire System (1) Test the fire extinguisher circuit. It is necessary to prepare a voltmeter, connected in parallel with a 24 volt lamp, of between 12 and 18 watts, in order to test the lines under load. Remove the two test links (FA and FB) on the electrical distribution panel in the main electrical compartment. Depress the 'push to extinguish' switches, and measure the voltage between each test link, in turn, and earth. Busbar readings should be obtained. Reassemble the links on completion of the test. (2) Check overhaul period of cartridge ridge firing units. Test the fire extinguisher cartridge/fuses and links. (FA and FB). Connect a safety ohmeter, which cannot deliver more than 13 milliamps, in turn between each test link output and earth. Measure the resistance in each circuit and ensure that it is between 5 and 6 ohms, plus the line resistance indicated, in each case, on a label mounted by the test links, reassemble the test links on complet pletion of the test.		

Item No.	Operation	Craft Hrs.	Signature
3.	<u>Fire System</u> Examine the fire wire sensing elements clips and bushes for damage and ensure that any damage found is within the limits set down in the Operator's Handbook, Sec. 3, Chap. 5.		
4.	<u>Thermocouples and Harness</u> Examine for cleanliness, damage, security of attachments and visible connections, locking and evidence of gas leaks. Examine carefully for distortion, abrasion, corrosion deterioration, and a visual inspection for cracks.		
5.	<u>Thermocouple and Harness</u> Check the electrical continuity and resistance of each of the thermocouple circuits as follows: (1) Uncouple the connector E.S.I. Connect the leads from a Wheatstone bridge to the pins of the connector, and measure the resistance between the pins. Reverse the connections from the Wheatstone bridge to the connector and again measure the resistance. The average of the two readings should be 1.25 plus/minus 0.1 ohm. (2) Uncouple the connector E.S.2. and check as in (1) above. (3) Using a 250 volt insulation tester measure the insulation resistance between: (a) The pins of the connector E.S.I. and the braid of the harness. (b) The pins of the connector E.S.2. and the braid of the harness. (c) The pins of the connector E.S.I. and the pins of connector E.S.2. In each case the resistance should be at least 50,000 ohm.		

Item No.	Operation	Craft Hrs.	Signature
6.	P.T.E.T. Trip Test the operation of the overtemperature trip amplifier, and the trip trip mechanism, as follows: (1) Test PTET Trip with Jet-Cal testor.		
7.	Generator Clean, ensuring that all salt deposits are removed. Examine the mountings and electrical connections for security.		
8.	Generator Check that the generator vetilation slots are clean and unobstructed.		
9.	Generator Drive (1) Check the condition and tension of the generator drive belts. Total 'play' in a belt should be between $\frac{1}{2}$ in. and 3/4 in. (12.5 mm. and 19 mm.) (2) Lubricate the powergrip pulley bearing for condition and for signs of rotation on the spigot.		
10. a	Generator Disconnect the craft wiring from the generator and, using an Avometer (NOT A MEGGER), check that the the resistance, between the semicircular busbars on the generator and earth, is not less than 0.5 megohm. Reconnect the craft wiring.		
11.	Gyro-Magnetic Compass (1) Inspect compass indicator and amplifier for corrosion. (2) Complete an operational check on test flight.		
12.	Power Turbine R.P.M. Indicator Check power turbine and gas generator tach indicators with engine test set.		

Item No.	Operation	Craft Hr.	Signature
13.	Inverter (Rotary) (1) Check the condition of the commutator and brushes. Ensure that the D.C. brush length, measured measured along the shortest edge, is at least 8.1 mm., and that the A.C. brush length measured from the shoulder is at least 5 mm. (2) Check the condition of the brush springs, and lubricate with one drop of a light oil. (3) Check the bearings and lubr ricate with oil.		
14.	Relays Cabin Check the following contactors for condition and secutity: (1) Starter. (2) Battery isolating. (3) Internal/external		
15.	All Instruments Test functionally. A.S.I. Pressure and Static Systems (1) Check the drains. If water is present, remove the drains, empty the water, and reassemble the drains. (2) Test for leaks, disconnect Air Speed Indicator and use air hose and adopter for Pitot Tube.		
16.	Cabin Plug sockets terminal blocks, Cable looms. Check all plug/sockets terminal blocks and cable looms for cleanliness, sdcutity, sighm of damage, chafing and deterioration.		
17.	Circuit Breakers and Switches Check for condition and security.		

Item No.	Operation	Craft Hrs.	Signature
18.	Cabin All electrical components. Examine the condition of the protective treatment, and check the potting comppund for damage and deterioration, particularyy for water ingress.		
19.	Engine, Fuel and Hydrolics Bays Check all components, plug/socket connectors and wiring for cleanliness condition and security.		
20.	(1) Check all lighting for continuity, security of mounting and electrical connections and lamps. (2) Conduct a power on check before test flight.		
21.	CHECK the engine electronic controls with engine test set.		

DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD

MAILING ADDRESS:
Commanding Officer
CG Station Fort Point
Presidio of San Francisco
CA 94129

1 August 1972

Coast Guard Station Instruction 98201

Subj: Daily/Weekly SAR MLB Check-Off List

1. Purpose: To establish a standard daily and weekly maintenance schedule for Hull, Engines, Auxiliary Systems, and SAR equipment on 44' MLBs.

2. Action: (a) The engineering department shall insure that the daily and weekly checks are performed on a regulary scheduled basis.
(b) Daily and weekly check list contained as enclosures to this instruction and shall be used when conducting these checks. The enclosed check list are as follows:

(1) SAR Boat Daily Check-Off List

(2) SAR Boat Weekly Check-off List

3. Effective Date: This Instruction is Effective Immediately.

W.E. WALLER
Commanding Officer

Coast Guard Station Port Point
Operation Plan
SAR Boat Daily Check-Off List

It	Item	Mon	Tue	Wed	Thu	Fri	Sat	Sun
1.	Check engine crankcase oil level							
2.	Check reverse gear oil level							
3.	Check engine fresh water level							
4.	Check hydraulic steering reservoir oil level							
5.	Check battery water level							
6.	Sound fuel tank-refill as necessary							
7.	Check shaft and rudder glands							
8.	Check HOTSTART for proper operation							
9.	Clean and dry engineroom bilges							
10.	Check for oil and water leaks							
11.	Check and refill spare engine oil and water containers as required							
12.	Check-refill drinking water containers as required							
13.	Rotate metal edge fuel strainers							
14.	Drain condensate from air receivers							
15.	Check battery sharger output							
16.	Operate engine and check following for operation:							
	a. Alarm systems							
	b. Operating gages							
	c. Lights, horn, siren, wipers							
	d. Eng. speed and reverse gear control							
17.	Check electronics gear for operation							
18.	Take and record L. O. viscosity readings							
19.	Record battery hydrometer readings							
	Battery #1							
	Battery #2							
	Battery #3							
	Battery #4							
	Battery #5							
	Battery #6							

(Note: Initial items as accomplished.)

SAR BOAT WEEKLY CHECK-OFF LIST

Boat No. _____ Date _____

DESCRIPTION OF WORK	INITIAL	REMARKS	PERS AS
Check M.B. sea strainers(for cleanliness)			
Check fire pump sea strainer(for cleanliness)			
Check fire pump belt tension			
Test jacket water(for chromate content)			
Check water recirculating valves for leaks and proper operation			
Lube power take off and test fire pump for proper operation			
Excercise all sea and skin valves and lube			
Clean intake air cleaner			
Check valve cover breather (Cummins)			
Check air box drains (General Motors)			
Engine Oil pressure, Port( )Stbd( )			
Alternator output, Port ( ) Stbd( )			
Check bilge pump operation			
Air compressor operation normal			
Air tank pressure normal			
Air born operation normal			
Inspect Aero Quip lines for wear and fraying.			
Drain sediment from fuel oil strainers			
Test fuel oil tank for water			
Inspect all machinery and equipment mounting bolts for tightness or damage			
Check alternator belt tension(do not over tighten)			
Check battle lanterns for operation			
Test floatable life ring ring lights			
Check engine room wiring connectors for tightness			
Running lights operating properly			
Compass lights operating properly			
Towing lights operating Properly			
General lighting operating properly			
Search lights operating properly			
Stern towing light operating properly			
M-G sets operating properly			
Shore power cables and fittings clean and tight			
Batteries-check to make sure terminals clean and tight.			
Spare Bulbs-lighting system			

DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD

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Commanding Officer
CG Station Fort Point
Presidio San Francisco
Ca. 94129

9820.2
30 October 1972

Coast Guard Station Fort Point Instruction 9820.2

Subj: SERV Machanical/Electrical Failure Trouble Shooting Check List.

1. Purpose: To establish guidelines for trouble shooting machanical/electrical failures on board the SERV while underway.

2. Discussions: (a) In the event of a machanical/electrical failure on board the SERV while underway the operator shall, in addition to the proceedures contained in station instruction 3100.6, conduct a machanical and/or electrical check in accordance with enclosures one and two to this instruction.

3. Action: Station Engineering Division shall insure that copies of enclosures one and two are conspicuously displayed in each of the assigned SERV's.

W. E. WALLER

Enclosure Two to CG Sta. Ft. Pt. Instruction 9820.2

Subj: SERV Electrical/Battery Failure Trouble Shooting Check List

1. Electrical Failure: (a) In the event of an intermittant electrical failure, the craft engine will automatically shut down when the system is re-energized due to the closing of a latching type stopcock.

(b) Also, when electrical power is lost, the Stator vane actuator (SVA) will stay in the position that they were in when the power was lost, this could cause various engine power losses or engine shut down. An example of this would be, if the SVA was in the closed position (below 60% N1) the gas generator will accelerate with an abnormally high T5 to the extent that the engine would shut down, due to an overtemp if the electrical power on the craft was re-energized.

2. Action: In the event of an electrical failure on board a SERV while under way the following immediate steps shall be taken.

a. Remove fuse Nr. 4 from the main fuse pannel, this will de-energize the stop-cock and prevent an unscheduled shut down.

b. Fuse Nr. 4 should not be re-inserted until the operator is ready to shut down the engine.

c. Caution: With fuse Nr. 4 removed, the craft's speed box has been bypassed and there will be no emergency shut down functions for overspeed, or for a manual shut down from the stop button on the control/instrument panel. The only way a shut down can be accomplished is by re-inserting fuse # 4 or by use of the low pressure fuel cock.

3. Precautionary Operating proceedures with fuse #4 removed.

a. To prevent overspeed due to bypassing of the speed box, of engine, extreme care should be used with throttle and prop pitch applications.

b. If the failure occured when the SVA was in the closed position (below 60% N1) the T5 should be continuously monitored to avoid overtemping the engine which could cause an unscheduled shut down/ and/or severe damage to the engine.

c. If the failure occured when the SVA is fully open (above 85% N1) extreme care should be used with throttle and prop pitch application to avoid a decell stall (flame out) due to an over lean mixture. Throttle and prop pitch should be kept as close as possible to the settings when the power was lost.

d. General: All throttle and prop pitch changes should be accomplished with slow easy application.

TAB C-16-B W. E. WALLER

Enclosure One to CG Sta. FT. PT. Instruction 9820.2

Subj: SERV Machanical Failures

1. In event of any failure call for assistance immediately; then investigate fully the nature of the failure and make repairs if possible.

a. In event you should lose a fan drive barrel gear coupling remove drive shaft so craft can get underway in a motorboat mode.

b. Any failure which may cause damage to the engine, gear train, or porp by make shift repairs, shall not be made on scene.

c. In event of a electrical failure, check fuse in suspected circuit as per fuse listing in operators ckeck booklet.

d. In event of cold hang up (no start) due to insufficient RPM the control battery can be swapped with either one of starting batteries.

W. E. WALLER

DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD

MAILING ADDRESS:
Commanding Officer
CG Station Fort Point
Presidio San Francisco
Ca. 94129

9820.3
27 October 1972

Coast Guard Station Fort Point Instruction 9820.3

Subj: MLB Monthly, Quarterly, Semi-Annual and Annual Check Off List.

1. Purpose: To establish and maintain an effective preventive maintenance program for the MLB's assigned to this station.

2. Scope: Coast Guard Naval Engineering Manual CG413 and various Commandant and District directives require unit commands to institute an effective preventative maintenance program. Enclosures one (Monthly), two (Quarterly), three (Semi-Annual), and four (Annual), are check lists designed to meet this requirement and are to be used as guides in carrying out this units maintenance program.

3. Action: a. The senior engineer assigned to the boat mooring is responsible for meeting the objectives outlined above. He shall insure that the required checks are timely and accurately performed. The check-off list contained in this instruction are to be used when the checks are made. The completed check list shall be signed by the engineer conducting the check and co-signed by the senior engineer in charge of boat dock. The signed form shall be appropriately filed with the boat record.

b. The prescribed checks shall be ~~made~~ completed as indicated below:
Monthly: 1st week of each month.
Quarterly: Last week of each quarter.
Semi-Annual: During each haul out period.
Annual: Every other haul out period and in conjunction with semi-annual check.

4. Effective Date: This instruction is effective immediately.

W. E. WALLER

Coast Guard Station Fort Point

SAR Boat Quarterly Check-Off List

Boat Nr. CG_____ Date:_____

Item	Initials
1. Change "Perry Water Filters" and inspect zinc plates for deterioration.	
2. Change oil and/or clean strainer in reverse gear.	
3. Thoroughly inspect hydraulic steering system including oil level, particular attention to loose or damaged fittings, pins, and hoses.	
4. Clean filter screen and magnet in "PT" fuel pump (Cummins)	
5. Inventory spare parts and submit request as required.	
6. Prepare and submit boat reports.	
7. Clean Kato M.G. set commutators and governors.	
8. Remove end bell from heat exchanger inlets, inspect and clean as necessary.	
9. Test the safety valves on the air tank.	
Remarks	

Coast Guard Station Fort Point

SAR Boat Monthly Check-Off List

Boat Nr.
Boat Nr. CG_____ Date:_____

Item	1	2	3	4
1. Lubricate tachometer cables				
2. Inspect, lubricate and adjust Marse Controls				
3. Clean fuel strainers				
4. Check alllvalve packing and adjustoor repack				
5. Inspect and weigh CO2 fire extinguishers				
6. Invert dry chemical fire extinguishers and shake				
7. Inspect fuel tank ball check vents				
8. Check zincs in raw water side of M.E. heat exchanger				
9. Check and clean all valve stems				
10. Rotate fire hose, inspect nozzle and spanner wrenches				
11. Check oil level on salvage pumps				
12. Strip fuel tank of water				
13. Tighten all engine mounting bolts to torque specs.				
14. Record engine data for trend analysis				
15. Check engine salt water pump internal condition				
Remarks				

Coast GuardSStation Fort Point

SAR Boat Annual Check-Off List

Boat Nr. CG_____ Date:_____

Item	Initials
1. Docking for annual hull maintenance.	
2. Completely inspect underwater hull for structural stress	
3. Inspect all hull zincs and electrical grounding devices.	
4. Inspect propellers, shafting, bearings, and replace packing	
5. Inspect all sea valves.	
6. Perform preventive maintenance as prescribed in manufacture instructions.	
7. Calibrate all gages and instruments.	
8. Clean fuel tanks.	
9. Remove and clean Hot Starts.	
10. Clean out all exhaust lines.	
Remarks	

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Ca. 94129

10/27/72
9820.4

Coast Guard Station Fort Point Instruction 9820.4

Subj: SERV Pre-flight and Post-flight Check-Off List and Flight Record Clearance Part 1, use of.

1. Purpose: To establish standard pre-flight and post-flight proceedures for use in carrying out daily routine maintenance on SERV's.

2. Discussion: To insure that proper corrective actions, concerning maintenance and upkeep on the SERV's are being carried out by the responsible duty section maintence crew, a check-off list has been developed. The list contains the essential items, of concern. Additionally, this instruction prescribes the requirements for use of the Aircraft Flight Record Part I and III, for clearing the craft for operational use, as well as for recording all craft descrepancy, corrective action, and expended man hours, etc.

3. Action: Each duty section leader shall be responsible for carrying out the prescribed pre and post-flight daily requirements. Enclosure One contains the check list to be used. Enclosure Two shall be used in accordance with the forms instructions. These forms are to be signed by the individual who performs the maintenance task and turned in to the engineering office prior to 0700 daily.

4. Effective Date: This instruction is effective immediately.

W. E. WALLER

Craft No._____ Date_____

Daily Check-Off List
Pre Flight & Post Flight

Item	Initials
1. Check cleanliness of interior cabin	
2. Check seat belts buckled across seats	
3. Check charts, binoculars, life rings etc stowed in desig. places	
4. Check tow bridle secured and safety wired	
5. Check to ensure no standing water in paniers	
6. Check all puff port doors & jacks for security	
7. Check all skirt lift jacks, bell cranks, & chains for security	
8. Check aux. oil for proper level	
9. Check main oil for proper level	
10. Check engine & gear cowlings for security	
11. Check propeller for damage & leading edges	
12. Check lift fan blades for erosin &ndamage	
13. Check skirt hinge pins for security	
14. Check to ensure that no loose gear is on outer suffaces of craft	
15. Check rudders for security	
16. Check all struts in side-bodies for security	
17. Check fuel content in main cell and both aux. fuel tanks	
18. Check windshield wipers for proper operation	
19. Before craft is secured for the night, engine will be washed out, dried out, and rust-licked (DO NOT rust-lick until temp is below 50°	
20. Each morning engine will be rinsed out by off going duty section	
21. Duty section will not be relieved until all discrepancies are signed off, unless not with in the capability of duty section.	
22. Remarks	

NOTE: To be completed and turned in to Engineering Office prior to 0700 daily.

ANNEX D

Availability and New Development in ACV's

The two Bell SK-5 SERV's currently in use by the Coast Guard are rapidly approaching a state of marginal integrety whereby their continued use ceases to be parctical or economically feasible. Both of the crafts ages, combined with their past extensive operational uses by both the Navy in Viet Nam, and the Coast Guard during the past two years, has resulted in absorbing most of the SK-5's designed life span. It is anticipated, that at best, only one SK-5 will be capable of feasable operational use beyond 1 July 1973. The SK-5 that is retired from operational use could then be utilized for additional spare parts for the maintenance support of the one remaining craft. This would more than likely extend the remaining SERV's operational use to 1 July 1974, at which time a replacement craft would be required. Bearing this in mind, this ANNEX will attempt to provide information concerning some of the state of the art ACV design features which appear to merit consideration for Coast Guard use. Additional discussion on a variety of new ACV, that may have potential application to both Search and Rescue and Aids to Navigation missions, is provided in a previous ACV Evaluation Report, EU 3960-02 dated 30 June 1972. Only brief mention will be given to those new ACV developments previously reported.

In the past five years the technology for the design of Air Cushion Vehicles has passed its infancy and reached a stage of development whereby the designer is no longer searching for methods of construction which will allow an ACV to operate and manuever at all. It now allows the designer the leeway of perfecting and aiming a design at a particular desired mode of operation. Considering this somewhat advanced stage of development, there is now also the oportunity to begin to study the economics of ACV operations which has been shown, earlier in this report, to compare very favorably to Coast Guard small boat operations.

Basic design features as far as craft structures and engine types have previously been the sole property of the British Air Craft Industry. The use of aircraft type light aluminum alloy structures was the rule of the day, but design refinements have allowed the use of heavier, far more suitable structures, that are better suited to the marine enviornment.

The Canadian Bell company and Enfield Marine of the U. K. have been the foremost contributers in the development of heavier structures using salt corrosion resistant marine alloys. The Bell Voyageur and Viking (Figure D-1 & D-2) series of craft have exibited a very heavy strong and corrosion resistant structure. Their structures are assembled in such a nature as to make them repairable and disassembled in the field. Complicated compound curves and structure, which make repairs difficult, have been, for the most part, eliminated saving on construction costs and repair/maintenance needs, supports facilities and skills. Examples of the welded aluminum extrusions concept of hull design, used on the Bell Voyageur and Viking, are shown in Figure D-3, 4, and 5. The other advantages of this type of structure, for CG application, are obvious.

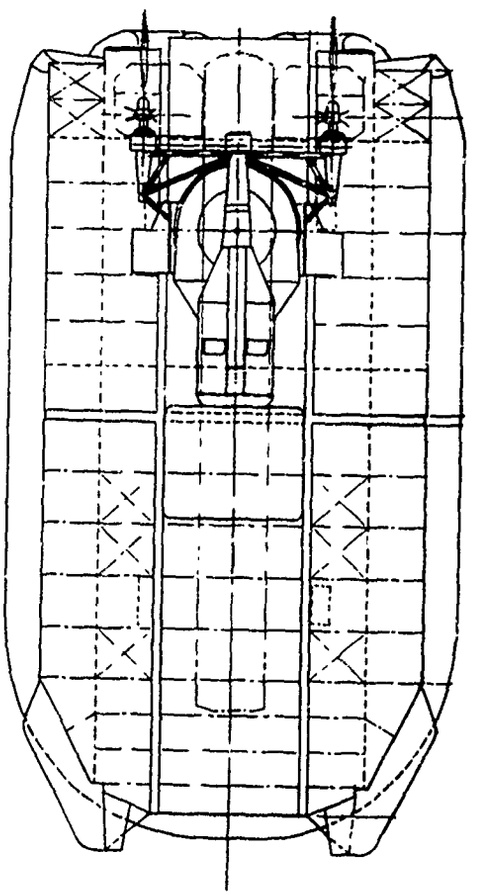
Artist drawing of Bell Viking Class ACV - Craft in the production stage at Canadian Bell Company.

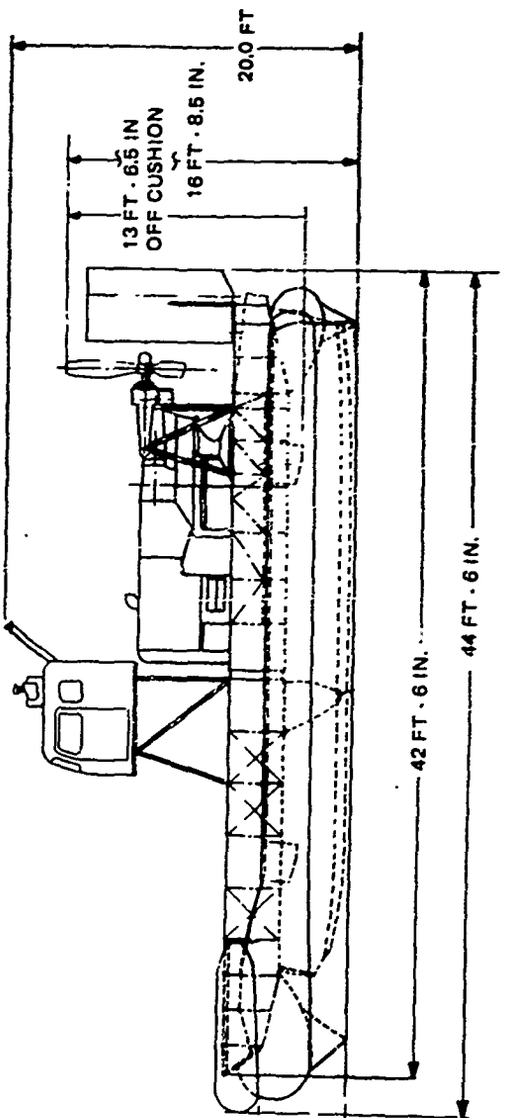
Performance

The normal gross weight of this craft is 32,496 pounds. Total ins alled power is 1300 SHP normal rating.

Vehicle Performance

Maximum Speed	- Calm Water	50 knots
	- Sea State 2	40 knots
	- Sea State 3	30 knots
Cruise Range	- With 5½ ton payload	120 n.mi.
	- Ferrying, Zero payload	680 n.mi.
Cruise Range	- With 5½ ton payload	2.4 hr.
	- Ferrying, Zero payload	13.0 hr.





General Arrangement - Viking Air Cushion Vehicle - 7501-000101

Principal dimensions and general data are as follows:

Overall Length	44.5 ft
Overall Beam	26.0 ft
Overall Height (on cushion)	20.0 ft
Propeller Diameter	9.0 ft
Fan Diameter	7.0 ft
Skirt/Trunk Nominal Height	4.0 ft

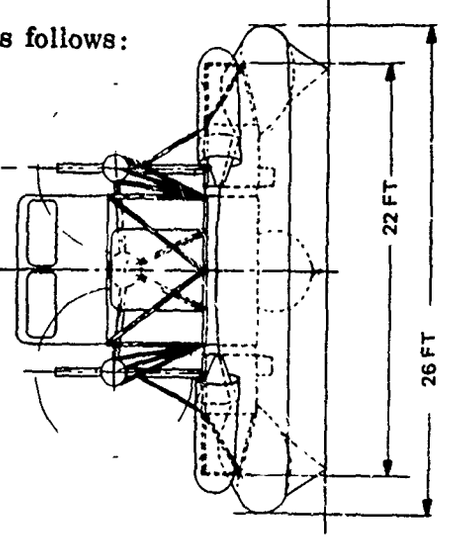
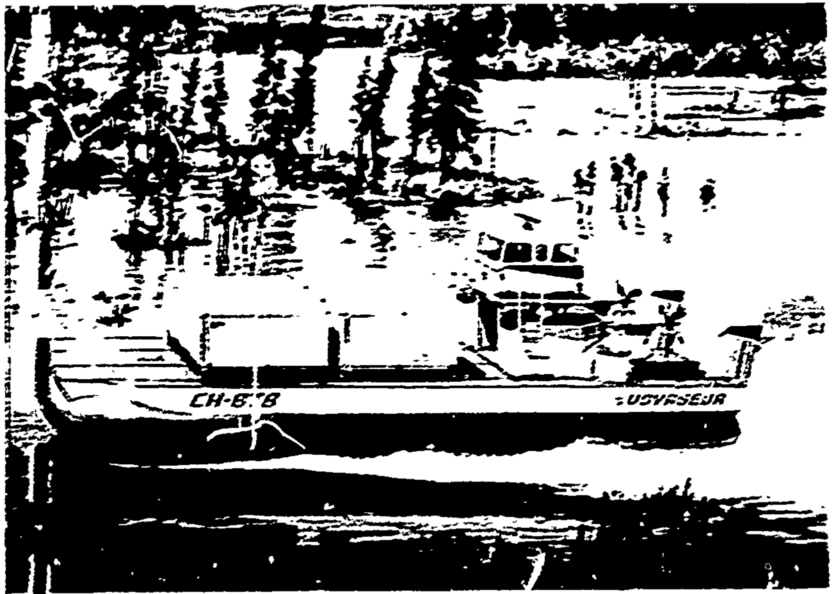
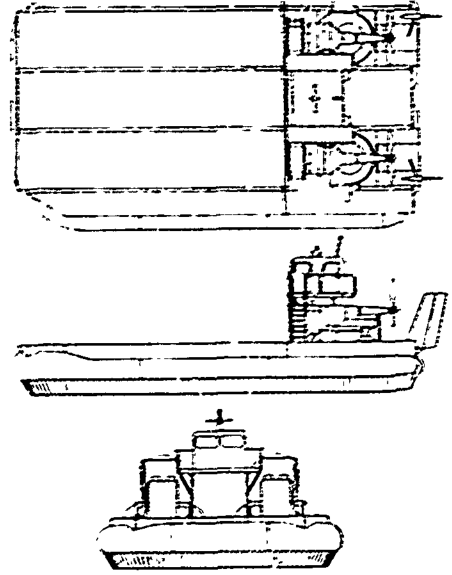


Figure D-1-B





VOYAGEUR

HEAVY HAUL AIR CUSHION VEHICLE

To meet the demand for effective economical transportation particularly in the Arctic and other not easily accessible areas of the world Bell Aerospace has designed the Voyageur Model 7380.

Voyageur features the capability of handling a 25-ton payload on a rugged flatbed structure fabricated with welded aluminum extrusions. Critical components such as transmission systems, lift fans, propellers and skirt elements have been proven in over 100,000 hours of operation. Voyageur is powered by two 1,300 shaft horsepower ST-6 "Twin Pac" power plants built by United Aircraft of Canada, Ltd. The engines are designed for cold-weather starting and operation, have multi-fuel capability and have been proven during more than [illegible] operating hours.

The 25-ton payload of Voyageur is equal to that of most transport aircraft now in regular supply operations in the Arctic. Thus the new air cushion vehicle would provide a direct transport link from the few, scattered [illegible] settlements, and support bases for the movement of men, equipment and supplies. The craft is of modular construction and can be readily disassembled into easily handled units for transportation by [illegible] air or road and quickly reassembled on site.

[illegible] studies and [illegible] tests have [illegible] that air cushion vehicles are most suited to providing year-round surface transportation in the Arctic. Because they ride on a cushion of air above the surface, air cushion vehicles can operate over difficult and varied surfaces [illegible] [illegible]

Bell Aerospace Canada

A DIVISION OF TEXTRON CANADA LTD

SPECIFICATIONS

DIMENSIONS

Length	64.5 ft.
Width	33.5 ft.
Height (on-cushion)	22.0 ft.
Height (off-cushion)	18.6 ft.
Skirt Height	4.0 ft.
Deck Height (off-cushion)	3.0 ft.

WEIGHTS

Weight empty	33,493 lb.
Maximum Gross weight	83,000 lb.
Fuel (maximum capacity)	1,930 Imp. Gal.
Crew	two

ROTATING MACHINERY

Power plant - two Twin-Pac ST 6 units 1250 SHP (continuous) each (United Aircraft of Canada Pratt & Whitney)

Propeller - 2 three-blade, variable pitch [illegible] diameter (Hamilton Standard)

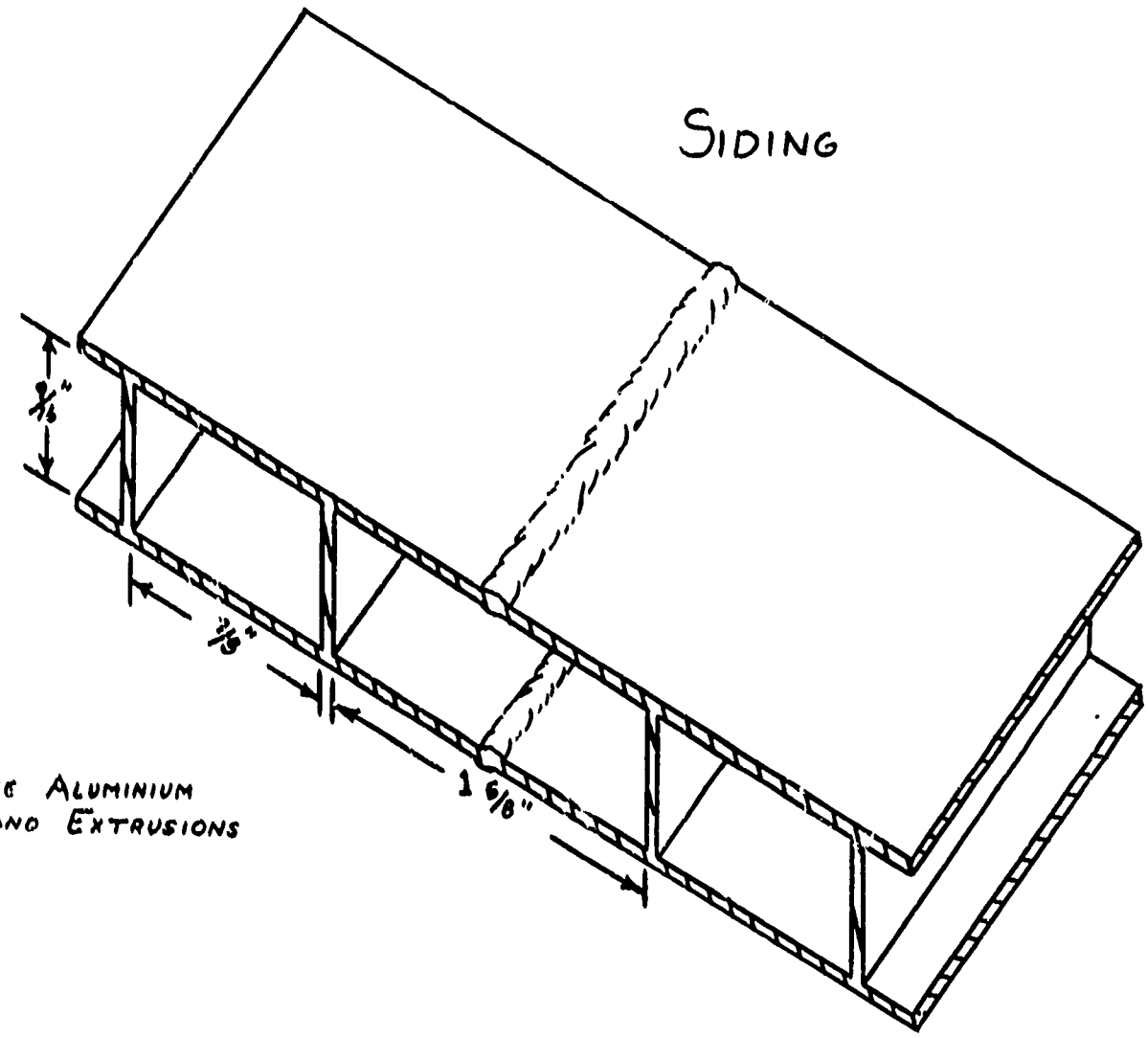
Lift Fan - two 7 ft. diameter centrifugal

PERFORMANCE

Maximum over water speed (calm) with typical barge load	50 mph
Endurance (with maximum gross weight [illegible] 50,000 lb payload)	10-12 hrs

Figure [illegible]

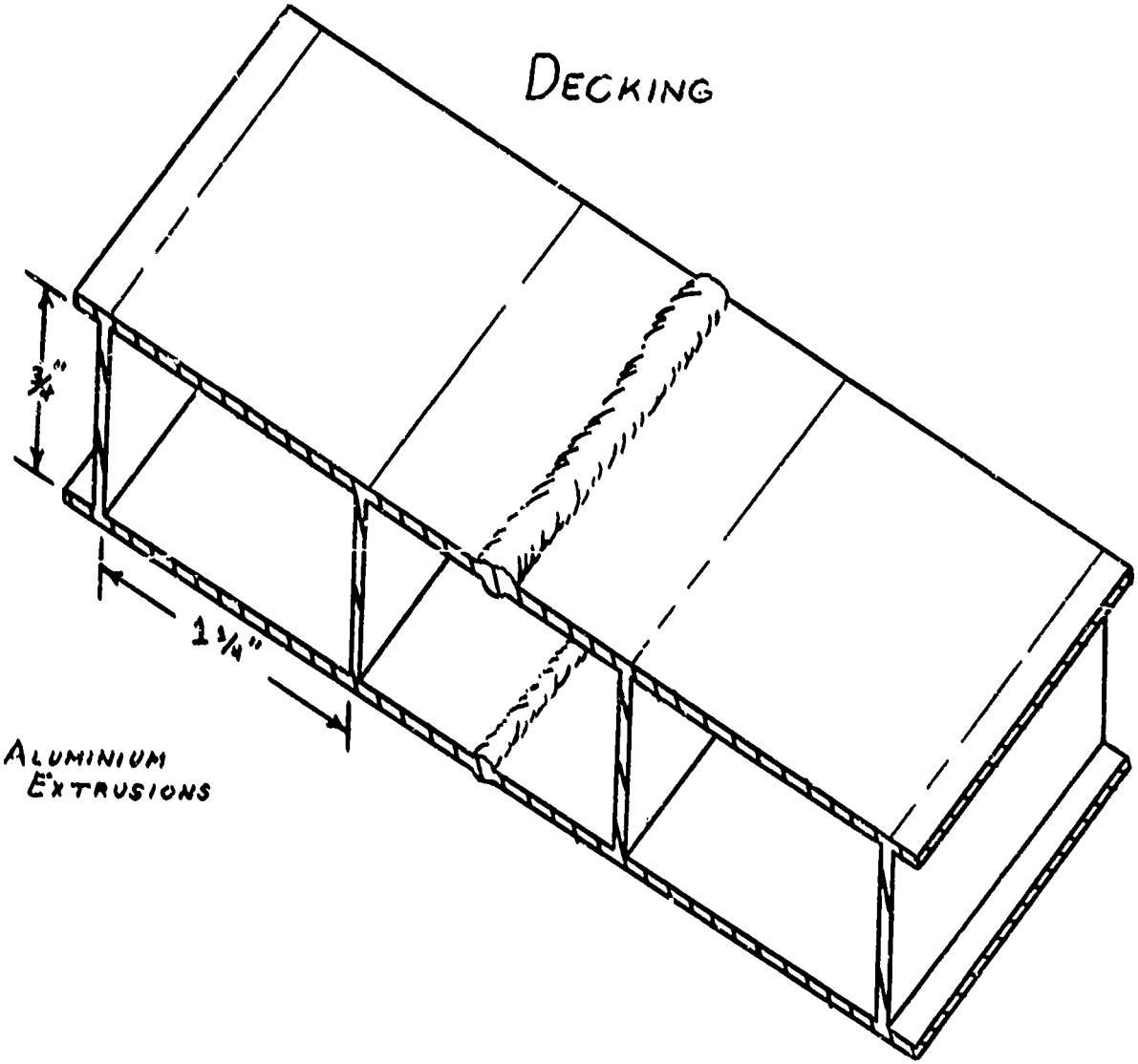
SIDING



STANDARD MARINE ALUMINIUM ALLOY SHEET AND EXTRUSIONS

Figure 2-3

DECKING

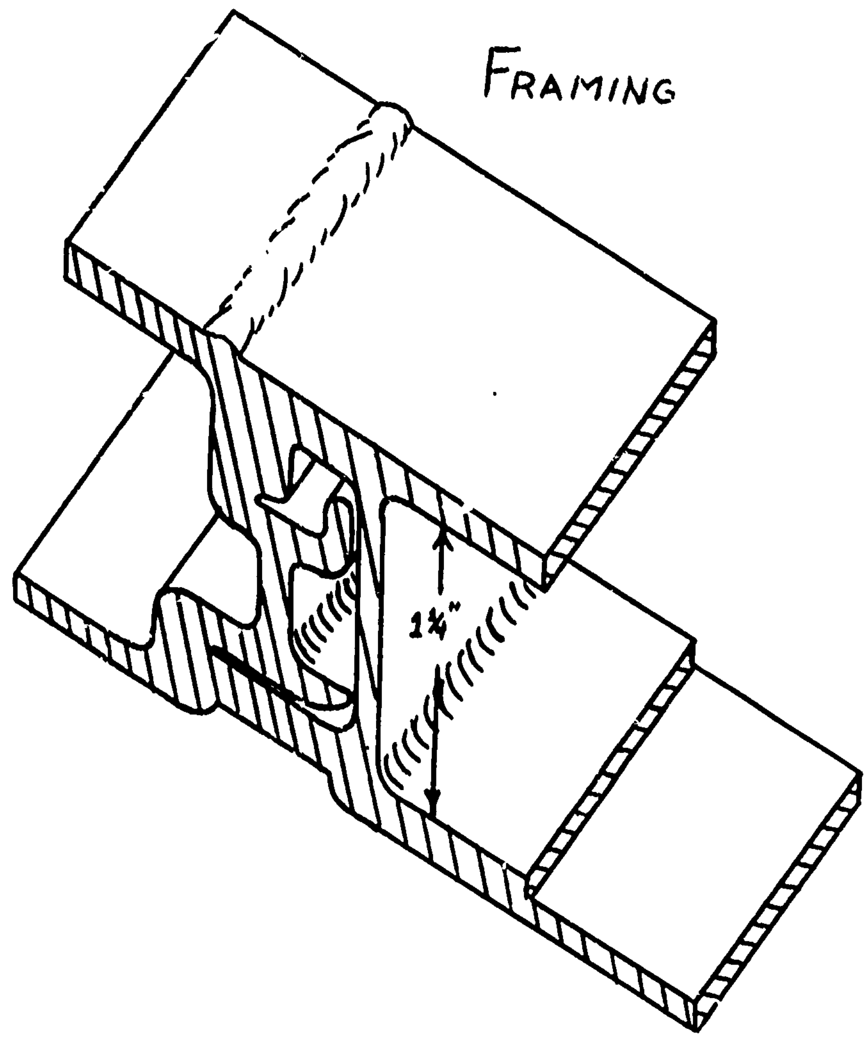


STANDARD MARINE ALUMINIUM ALLOY SHEET AND EXTRUSIONS

D-6

Figure D-4

D-7



WELDED ALUMINIUM ALLOY

Figure D-5

Several techniques have been developed for savings and better reliability of engines which had previously been almost entirely aircraft oriented. The most obvious is the use of industrial gas turbines. Both the British and Japanese have began the use, in larger craft, of industrial turbine engines which are built in the United States, notably by Lycoming and Solas. Other smaller engines are now available from several other companies which offer the advantages of lower maintenance requirements because of simpler design and more rugged componentry. The British Enfield Marine, EM2 (Figure D-6), is a notable example of this. The EM2 utilizes two Waukesha T-400 industrial gas turbines. The T-400, as other industrial turbines, embodies features intended to give long periods of continuous, maintenance free running with the engine dry weight and specific fuel consumption being of secondary importance (Figure D-7). In the case of the T-400, the dry weight is 700 pounds and specific fuel consumption at a 400 SHP rating is 0.9 lb/shp/hr. These figures are substantially in excess of the aircraft type turbines used on the SK-5 and other hovercraft, but so also are the times between overhaul (TBO). The manufactures TBO figures on the T-400 is quoted as 20,000 hours with an estimated overhaul cost of $7,000.00. As a comparision, the LM-100 gas turbine used on the SK-5 SERV requires overhaul (TBO) at an estimated 2000 hours. A recent quote from G. E. for a TBO overhaul on an LM-100 was estimated at $41,000.00. Although the Waukesha T-400's only marine craft installation has been on the EM2, recent tests with the EM2 have shown it to be very effective for ACV applications. The manufacture does however, anticipate the TBO may be somewhat reduced in a salt-laden atmosphere environment. The extent of this reduction is not yet known, but it is considered that it will be small. Figure D-8 illistrates another small industrial turbine manufactured by AVCO Lycoming Division. This 600 SHP LTS101 also looks promising for the 40' class SERV.

Some additional general features that lend themselves to easing the maintenance problems peculiar to ACV are described as follows: One is a system of integrated hydrolic jacks build into the Australian C6B hovercraft, (Figure D-9). This system allows the craft to lift itself for hull inspection or work thus aleviating the need for expensive cranes and lifts. This system would be particularly helpful with smaller SAR craft which might be despersed individually to smaller stations. The Australian system has been proven, for several years on smaller one ton payload machines and is considered as being very feasible for larger ACV in the 40 to 50 foot class.

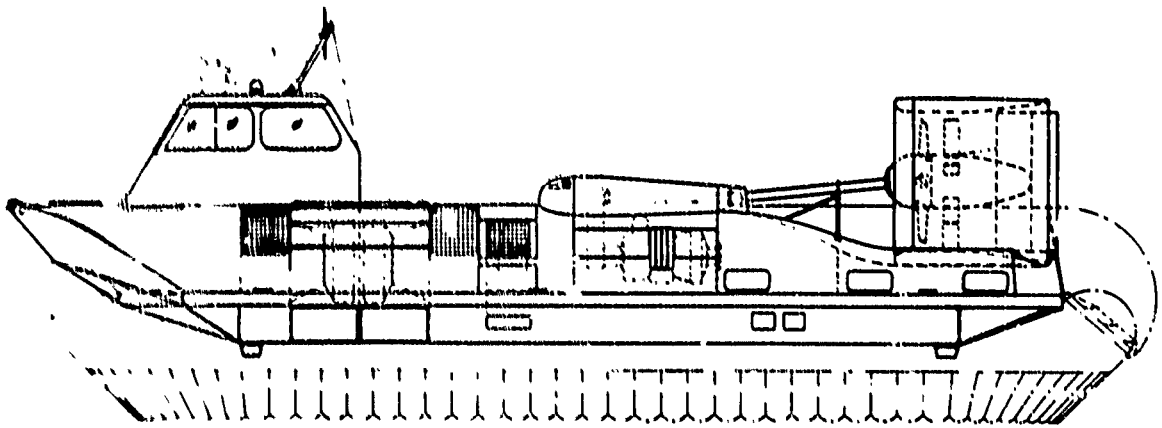
The second general area of features departs from design philosophy towards componentry or overall craft configuration which are considered applicable to SAR suties. Twin propellers are desirable for control, but on the stern of a smaller SAR vehicle make towing and working from the stern difficult, if not so dangerous as to be impossible. A foreign developed vehicle which aleviates this problem is again the Enfield EM2 (Figure D-4). This craft uses shrouded props or fans. The shrouding itself has several desirable effects.

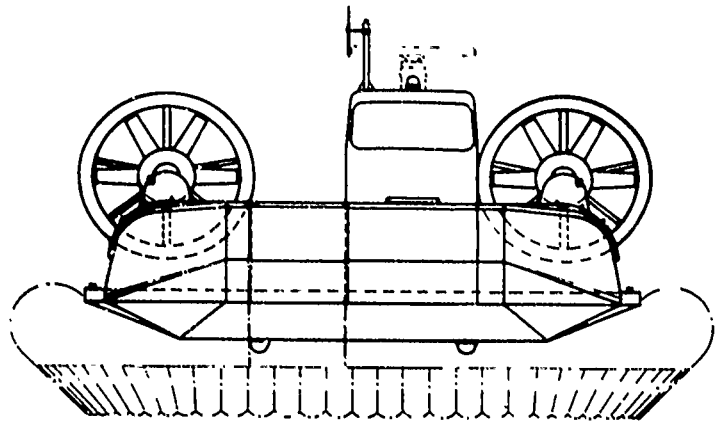
It first increases effeciency for any given prop. Secondly, it drasticaly reduces the noise level thereby increasing the ACV's environmental desirability. Third, with the increased efficiency and decreased noise, it allows the use of smaller diameter higher speed fans which in turn leaves more working room on the aft end of the craft. The fourth, and most important aspect of the shroud or duct, is the protection that it affords for towing lines and crew working area. Shrouding in general will not protect the propeller from a snap-back of a parted line, but will allow lines to pass over and around the propulsion units safely. Bell, of New Orleans, has developed and tested ducted props for the Navy's amphibious assault landing craft currently undergoing operational tests at New Orleans, (Figure D-10). Although the Navy landing craft is considered much to large for practical SAR application, it is considered feasible that a scaled down version might satisfy many of the SAR and A to N missions requirements. Possibly the Bell Vikings general configuration may also accept modification for installation of this type of propulsion unit (ANNEX E).

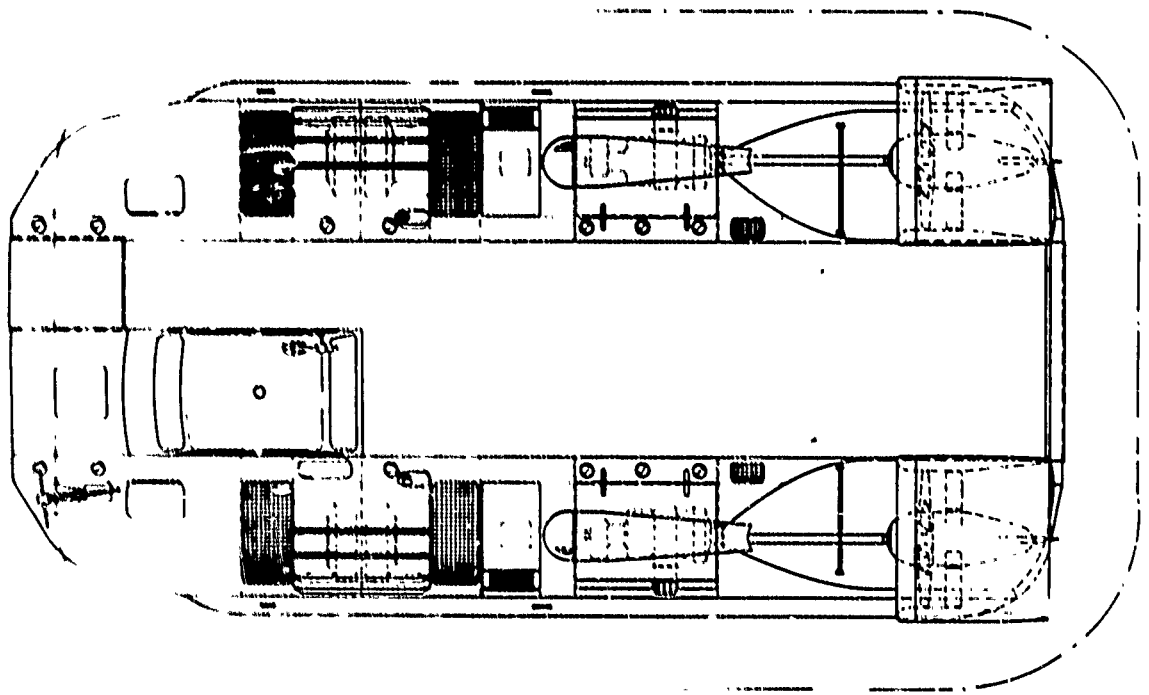
Another development which may have desirable qualities for SAR or A to N duty is the evolution of the medium size ACV which is easily road or air transportable. Two significiant craft in this category have been developed in the U. K. The first is the small Sealand SH2 (Figure D-11). This machine is presently configured with a six seat capacity and uses a Chrysler automotive engine. It also has ducted props for increased efficiency and safety. Although this craft is small it can readily have two road wheels and a towing tounge attached for over the road towing. This is possible because of the inflatable side decks which when deflated can be stowed flat along the sides of the craft decreasing the width of the craft by more than half to a standard eight foot wide load.

The other craft with simular capabilities, is the somewhat larger ten seat Cushioncraft CC-7 (Figure D-12). It is powered by a small gas turbine driving two cintrifugal lift fans which also act as the propulsion by bleeding of a portion of the air and ducting it to the rear or forward for reversing. All of the fan manhinery is enclosed making it safe to work on the rear for towing operations. The crafts propulsion system has been proven on small and medium sized craft so far but, has yet to be tried on larger vehicles. The second significant feature of the CC-7 is the use of inflated side decks. These side decks or plenums are made of the same rubberized nylon fabric as the normal skirts but can be deflated and stowed against the side of the center body for transport. Also, the lack of solid decks sections makes the craft ideal for working Aids to Navigation. Such as bouys and for SAR work alongside ships and other small craft. The plenum chambers in this case could act as a bumper aleviating craft hard structure damage. Another significant point of interest is that Cushioncraft Ltd, which developed this machine, has recently been bought by the British Hovercraft Corps. This now make the CC-7 available in the U. S. because of licensing agreements between BHC and Bell Aerospace Corp.

As stated before, ACV's or hovercraft are now out of their infancy and industry can now afford the luxury of examining componentry and tayloring craft for specific missions. Although buying fireign machinery is difficult,it should be obvious that some componentry and many ideas, if not the machines themselves, could be of considerable aid in the U. S. Coast Guard,specifically SAR A to N duties.







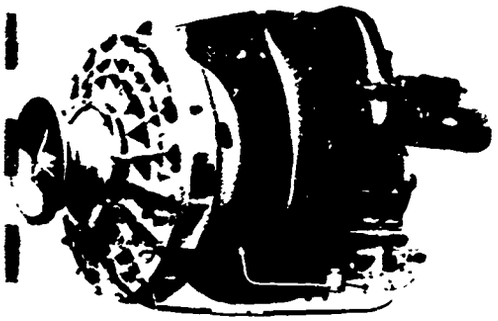
DETAILS

LENGTH O/A (HARD STRUCTURE)	40FT
BEAM O/A (HARD STRUCTURE)	21FT
CUSHION AREA	700 SQ.FT.
NORMAL A.U.W.	30,000 LBS.
EMPTY WEIGHT	18,630 LBS.
CUSHION PRESSURE (NORMAL A.U.W)	42·8 LB/SQ.FT.

E.M.2. FREIGHT HOVERCRAFT

Figure D-11

Waukesha Turbines for Enfield Marine



T-400 GAS TURBINE

NEW ENGINE WITH NO AIRCRAFT INFLUENCE

SELECTED by Enfield Marine Ltd to power their new EM-2 utility hovercraft project, the Waukesha T.400 turbine is the first industrial gas turbine to be applied to a commercial air riding craft. Designed by the Waukesha Motor Company, of Waukesha, Wisconsin, U.S.A., the T.400 embodies features intended to give long periods of continuous, maintenance-free running, with engine dry weight and specific fuel consumption being of secondary importance.

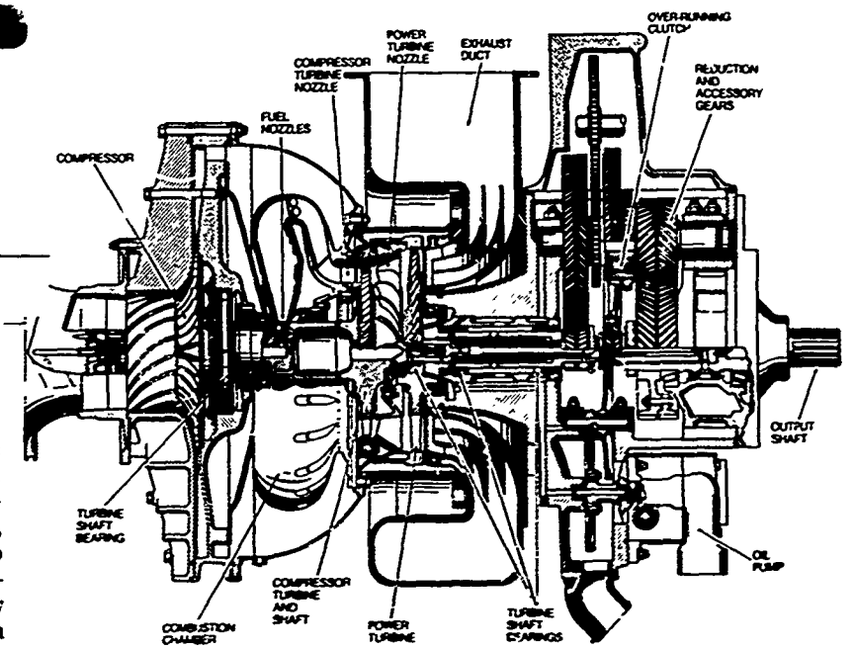
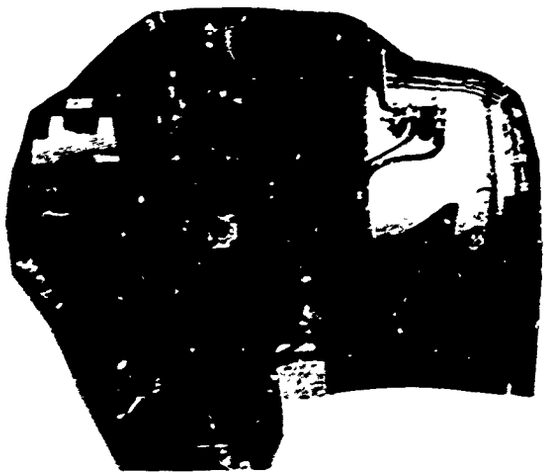


Figure D-7

new Lycoming "motor"

The 600 shp LTS 101



For one thing, the LTS 101 weighs but a fraction of the internal combustion engines which are now used in these roles — and occupies less than half the volume of such power plants.

For another, this remarkable gas turbine has been designed to operate at conservative temperatures, and is of such simple "pioneered design" that its price is way below the figure you'd expect in a gas turbine.

The LTS 101 is designed to thrive in a variety of hostile environments: it shrugs off sand, rain, dust, snow or ice. The advanced particle separator filters out the abrasive particles that cut short the life cycle of a conventional gas turbine.

Another thing: the low cost simplistic design is further enhanced by low maintenance and operational costs. The particle separator, the accessory/reduction gear box, the gas generator, or the combustor/power turbine assembly modules can be quickly replaced to give you maximum utilization.

Figure D-7 & D-8

HOVERGEM G6B

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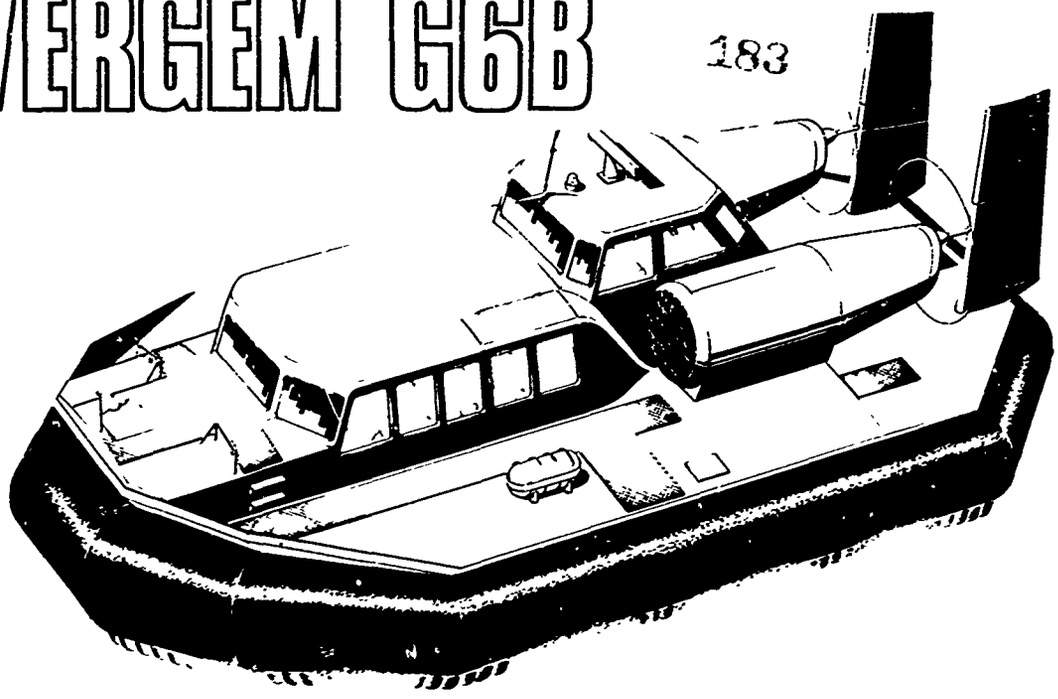


Routine inspection and corrective maintenance of the underside of the craft and skirt is simplified by the inclusion of an inbuilt hydraulic jacking system which will lift the unladen craft 3 feet above a firm level surface.

The design of the vehicle satisfies the Requirements for Air Cushion Vehicles as laid down by the Commonwealth of Australia Department of Shipping and Transport.

SPECIFICATIONS

Engine Data

Engine	:	Two Lycoming O–640 320 h.p. each at 2700 rev/min. Cruise rating, 210 h.p. at 2400 rev/min.	Exhaust System	:	Stainless steel pipe cross-over arrangement incorporating three large mufflers for each engine.
Accessories	:	Electric Starter Generator Hydraulic Pump Hydraulic Governor Dry Automotive type Air Filter	Fuel	:	100/130 Octane Aviation Fuel or Super Automobile Fuel
			Oil	:	SAE 50

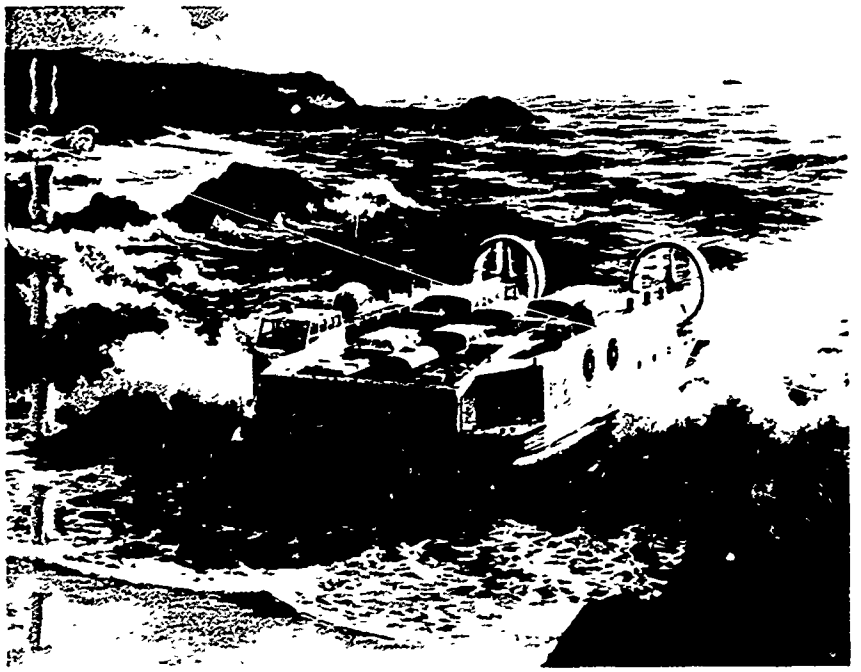
PRINCIPAL DIMENSIONS AND WEIGHTS

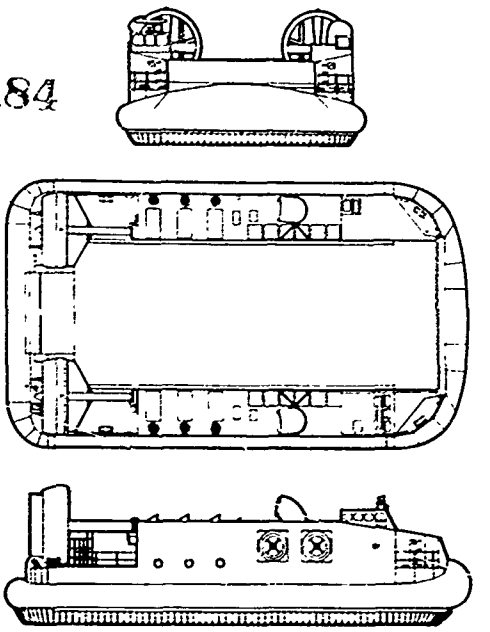
Length	34 ft. 6 in.	Tare Weight	5110 lbs.
Length, over skirt	37 ft. 0 in.	Water Ballast 80 gals. max.	800 lbs.
Width	17 ft. 0 in.	Driver	170 lbs.
Width, over skirt	20 ft. 0 in.	Fuel	580 lbs.
Height, on cushion	12 ft. 6 in.	Payload, 12 Passengers (150 lbs each)	1800 lbs.
Height, at rest, on pads	9 ft. 10 in.	Seats, six double at 30 lb each	180 lbs.
Height, at bow, on cushion	7 ft. 0 in.	Gross Weight	8640 lbs.
Cushion Area	540 sq. ft.	Cushion Pressure (Gross Weight)	16 lbs./sq. ft.
Cushion Escape Length	95 ft.		

PERFORMANCE

Maximum Speed (in Still Air and in Good Trim)	70 m.p.h.	Negotiable Gradient (Standing Start	1 in 7
Cruising Speed Range	35 to 50 m.p.h.	Maximum Obstacle Height	2 ft. 6 in.
Endurance (Cruising Power	3 hours	Maximum Sea Height	4 ft.

FIGURE 7–5





LC JEFF(B)

The LC JEFF (B), a 160-ton air cushion Amphibious Assault Landing Craft (AALC), is an outgrowth of a 10-year U.S. Navy development program. Since 1965 the Navy has been evaluating and defining criteria for an improved amphibious assault landing system in terms of flexibility, speed and cost effectiveness in the movement of material and equipment from ship to shore.

The craft will have a nominal operating speed of 50 knots and will operate both from the well-decks of landing ships and along side cargo ships. It has a design payload carrying capacity of 60 short tons with an overload capacity of 75 short tons. The payload will consist of palletized supplies and/or equipment up to the size of the 60-ton Main Battle Tank.

The JEFF (B) will be of aluminum construction with propulsion and lift fan systems powered by marine gas turbine engines.

The JEFF (B) will have an operational speed five times that of conventional assault craft and will be able to transition from the sea up onto the beach to designated off-loading points.

In 1970, the Bell Aerospace Division of Textron was awarded a U.S. Naval Ship Systems Command contract for the preliminary design of the JEFF (B).

The Navy awarded Bell its present contract to design, build and test two AALC prototypes in March 1971. The 54 month program is being implemented at Bell New Orleans Operations in Louisiana.

Bell Aerospace
a division of textron

SPECIFICATIONS

DIMENSIONS

Length	
Overall	86 feet 9 inches
Stowed	80 feet
Width	
Overall	47 feet
Stowed	43 feet
Height	23 feet 6 inches
Cargo Area	1738 square feet
Bow Ramp	28 feet wide
Stern ramp	14 feet 6 inches

WEIGHTS

Normal Gross Weight	325,000 pounds
Normal Payload	120,000 pounds
Overload Payload	150,000 pounds

CREW

Operations	Four
Deck	Two

POWER PLANT

Engines	6 AVCO Lycoming TF40 Marine Gas Turbines. Normal Continuous Power 16,380 SPH
Propeller	Two 4 bladed Hamilton Standard Propellers – diameter 11 feet 9 inches
Fans	Four Double-entry Centrifugal Impellers – 5 Feet Diameter Feeding Cushion and Bow Thrusters
Fuel Capacity	6,250 gallons

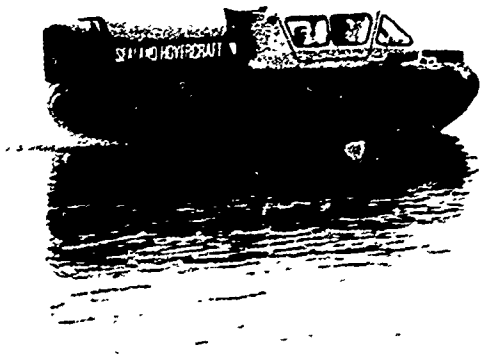
PERFORMANCE

Speed	50 knots in sea state 2
Range	200 Nautical Miles
Max Gradient Continuous	13%

Figure D-10 05-04200

Figure D-11

SH-2 Hovercraft in Operation



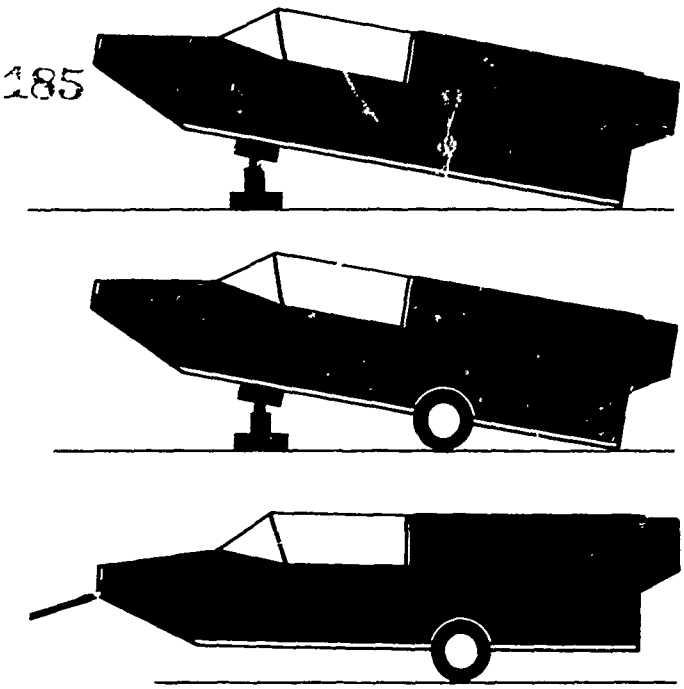
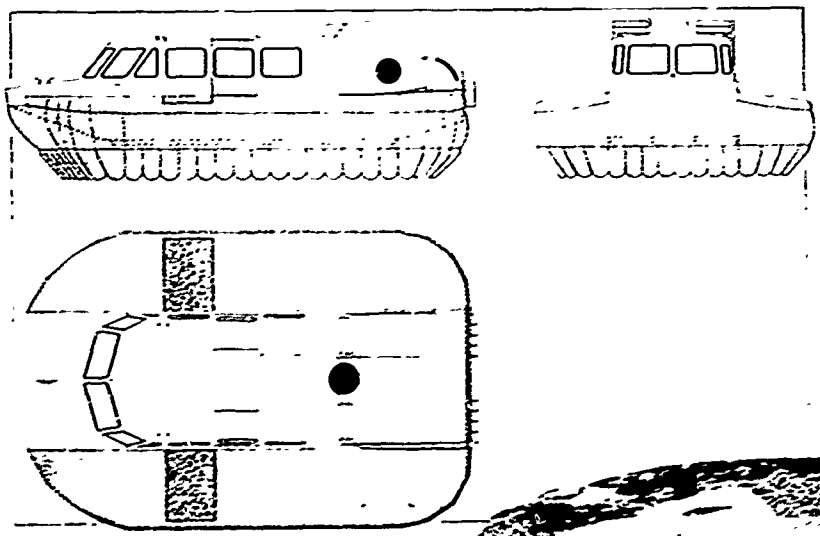


Figure D-12

UTILITY: Cushioncraft CC-7



CC-7 LEADING DATA

Power Plant Lift and thrust engine: one United Aircraft of Canada ST-6B60DK marinised gas turbine developing 390 b.h.p. at 6,000 r.p.m. (max continuous).

Dimensions Overall length 24ft 4in; overall beam 15ft 2in; beam with sidebodies deflated 7ft 6in; height 7ft 8in. The craft, with spares, will fit a standard air-freighting crate 30ft × 8ft × 8ft in size.

Accommodation Seats for two crew and six passengers plus two extra folding seats for passengers in doorways.

Weights Empty 2,880lb; payload 2,120lb; all-up weight 5,000lb.

Performance Max speed 50kt; max gradient 1 in 6; max endurance with standard 110gal tank 2hr; hard structure clearance 1ft.

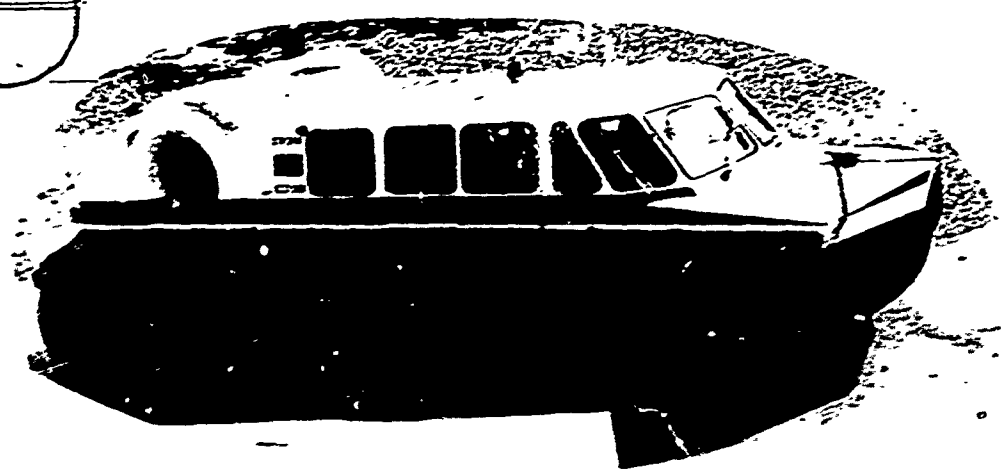


Figure D-11 & D-12

ANNEX E

PROPOSALS AND RECOMMENDATIONS FOR FUTURE CG SERV'S AND BOAT/SERV STATIONS.

During the current study and previous eighteen month evaluation of the SERV's desirability for CG mission application, several notable ideas have been formulated. These ideas, in the form of proposals and recommendations, are outlined in this ANNEX. The proposals that are offered are based on the experience of two and one half years of continued CG operational study of SERV's. This information is intended to provide a source of useful data for future CG planing of new SERV design and componentry, as well as planning for further exploitation of additional Boat/SERV Coast Guard Stations.

ESTABLISHMENT OF DUAL RESPONCE CONCEPT UNITS:

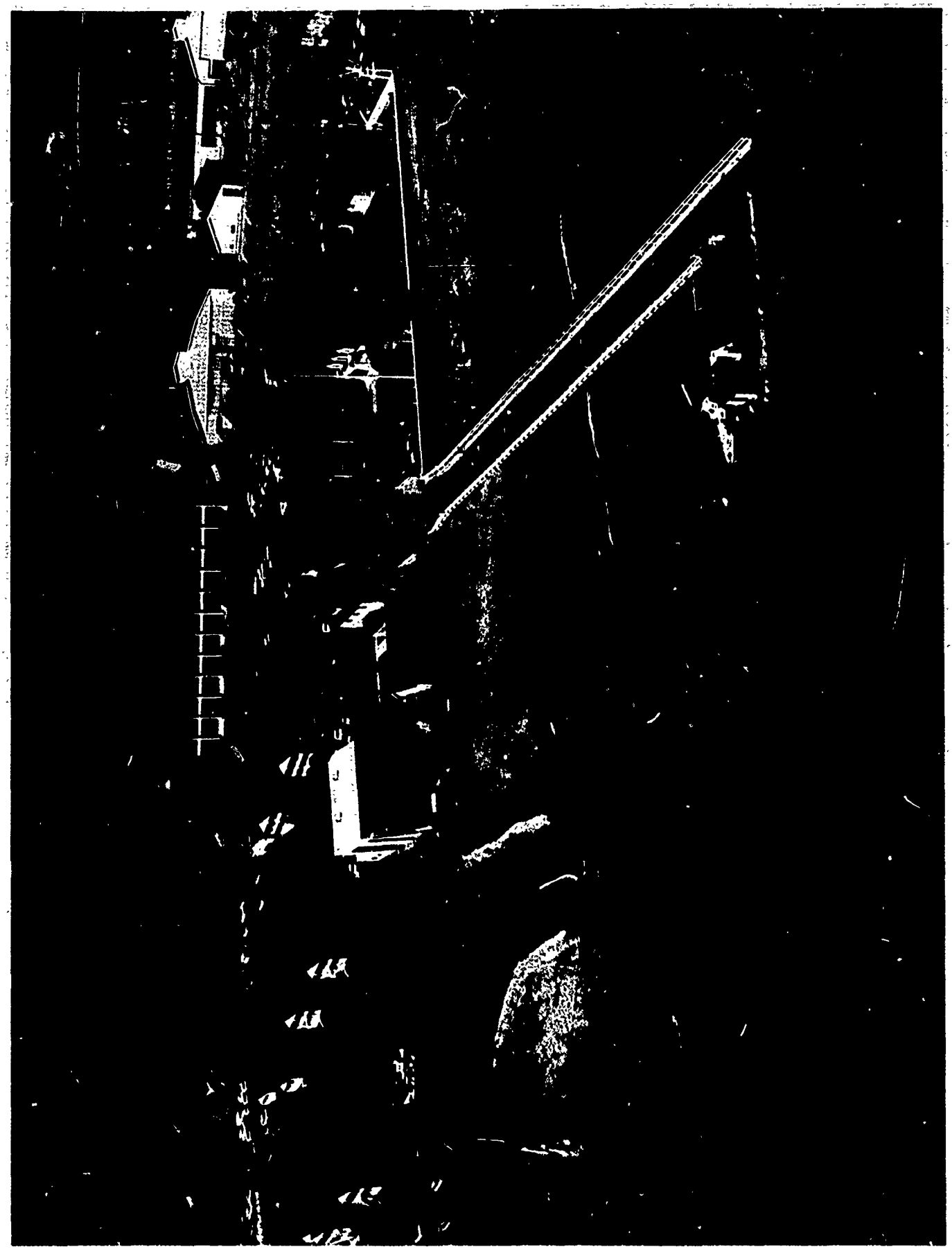
TRANSITION: As previously pointed out in ANNEX C, the transition phase of an operational endevior of this type can be excessively demanding on the unit man power force. Therefore, it is recommended that for a period of approximately three months, additional personnel, form within the unit's group, be assigned to the particular unit that is schedlued for Boat/SERV operational transition. This should inturn help to provide for a more productive, as well as more effective, cross training program.

BOAT/SERV CROSS TRAINING: Past experience has shown that operation and maintenance training requirements for SERV's is much more demanding than that of Coast Guard small surface craft. This is true for several reasons. For instance, the SERV's capability of operating on the surface at speeds greater than 50 kts, in variable sea, weather, and visability conditions, places demands on the SERV crew that very closely resemble the demands that are experienced by a sea plane crew while the sea plane is in a landing and take off configuration. These demands require that the SERV crew have a better than average knowledge of the craft capabilities and limitations, as well as area familurization. On the other hand, the SERV maintenance personnel, who also crew the craft, have the additional requirement of qualifing to cope with the different maintenance demands of the SERV's unique componentry. With utilization of turbine power plants, the maintenance requirements for the SERV are obviously much more precise than that required for diesel power plants used on Coast Guard small boats. In any event, the system is new, and the trainees must become familuar enough with it to perform the required maintenance. The past six months of dual operational study has shown that the cross training of CG small boat operation and maintenance personnel can be easly accomplished. The success of the cross training however, relies heavely on an effective and comprehensive training program, as well as the element of time. The fact that time is such an essential factor is because of the established SERV crew time criteria necessary for qualifing at the various SERV crew positions. It is highly recommended that the time requirements for SERV crew qualification not be relaxed. Experience has shown, especially in the case of the SERV operators, that fifty hours at the controls is an absolute

minimum for operator qualification. Some operator trainees may even require more than fifty hours control time before they are able to successfully complete the operator check ride requirement. An additional operator requirement is that the operator trainee have a minimum of one hundred and fifty hours of total craft time and be qualified as a radar navigator and sar crewman.

As is easily decernable from the above comments, SERV crew training is a very essential factor in the overall effectiveness of the dual responce unit concept. Bearing this in mind, the following suggestions concerning the application of an effective cross training program are proposed. First, all cross training should be conducted at the unit's that are scheduled for SERV operations. Consideration should be given to establishing training teams to accomplish this. The expertice for this concept of training, is currently available within the Coast Guard at CG MLB/SERV Station Fort Point, San Francisco, California, and should be utilized for this purpose. It is felt that the training team would be the most prectical approach to training until the SERV's utilization became more plentiful throughout the Coast Guard. This would probably take two to three years of operational phase-in. After the phase-in period, training could then be realistically carried out at the local level. There are several advantages to utilizing the training team concept. One is that it provides for the continuety of training standards and set operational and maintenance practices and procedures. Two is that it enhances the training process by eliminating the burden of area familiarization which in turn provides time for learing the SERV itself. Also, with this approach, the trainee is then able to apply the SERV's capabilities and limitations to the area that his unit is responsible for. Third, and perhaps the most significant, is that in addition to making the most effective use of the training time, the concept is much more cost effective than that of establishing a single SERV training unit.

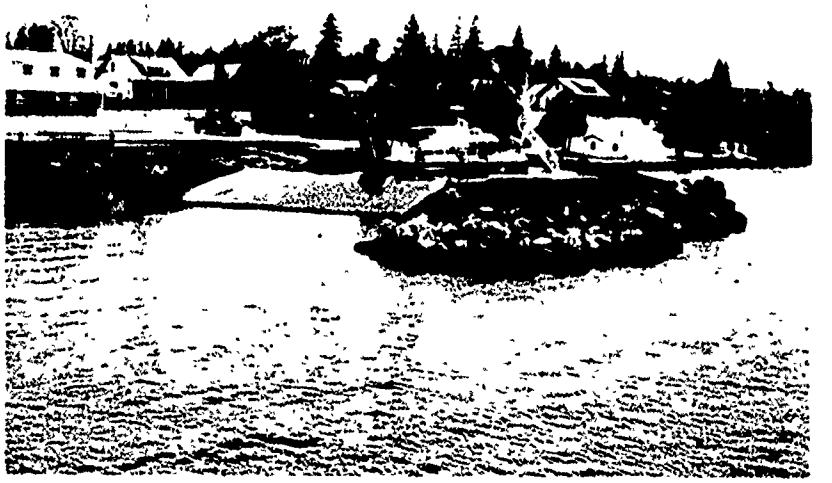
BOAT/SERV STATION FACILITIES: It has been shown in all of the CG SERV operations to date, that probably all of the existing Coast Guard small boat stations can be easly modified to accept SERV operations. Not only has this been proven at Fort Point Coast Guard Station (Figure E-1), but also at Saint Ignace Coast Guard Station in the Ninth District, and Milford Haven Station in the Fifth District (Figure E-2). Although the boat maintenance facilities utilized at both the fifth and ninth district operational sites were adaquate for routine SERV maintenance, they were not adaquate enough to conduct some of the more demanding SERV hull maintenance that was frequently required, especially with the SK-5 model ACV. One very notable deficiency was the inability to lift the SERV for routine bottom inspection. In order to accomplish this, commercial cranes had to be utilized. Another significant problem area, with regard to SERV maintenance support at the fifth and ninth district sites, was the lack of a sheltered SERV maintenance facility. This also hindered good maintenance practices.



Coast Guard MLB/SERV Station Ft Point, San Francisco, Ca.

Figure E-1

SERV operating ramp and apron at CG Station Milford Haven (Chesapeak Bay).



SERV operating ramp and apron at Station St Ignace (Northern Great Lakes) summer.

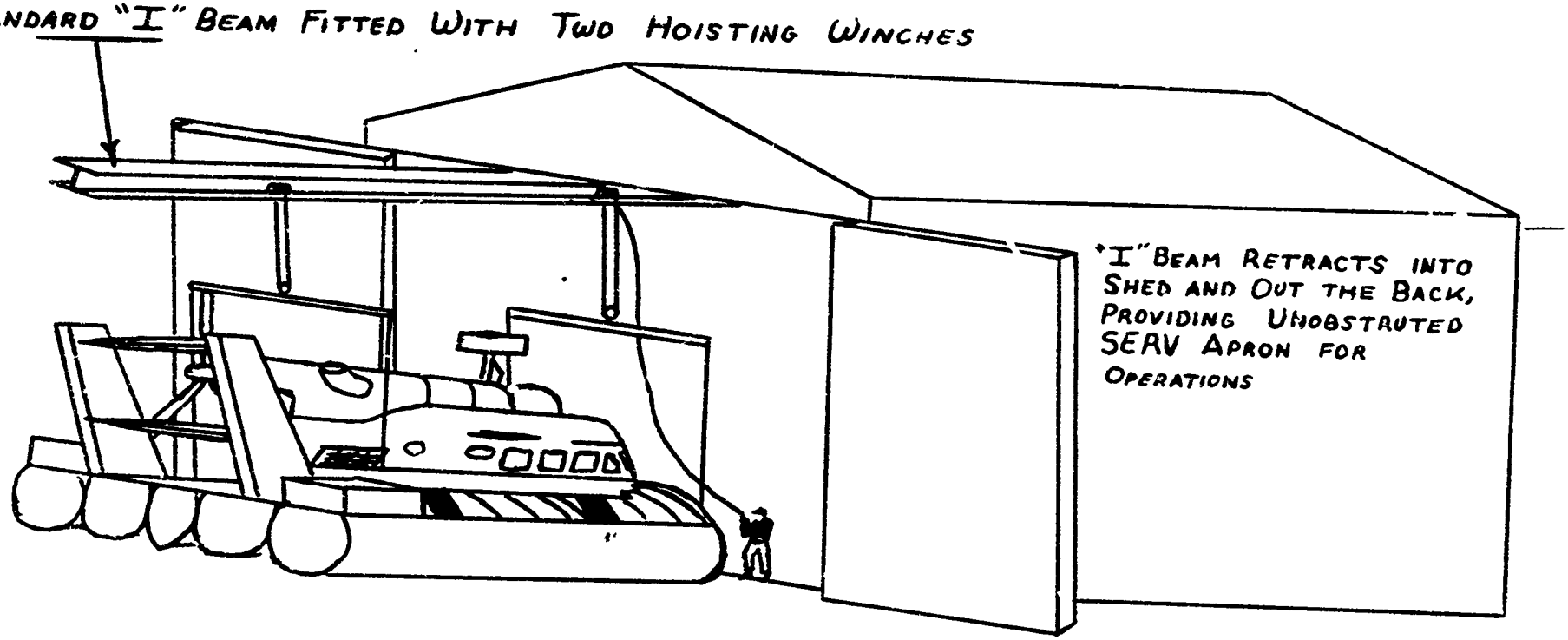
Station St Ignace facility during winter (obvious requirement for sheltered maintenance area).

Figure E-2

Obviously, there are several approaches to alleviating the noted deficiencies. One would be to conduct all required maintenance and hull bottom inspections at Coast Guard Group industrial facilities where more often tnan now cranes or large bouy tenders are available and could be used to lift and transport the SERV to a suitable maintenance site. Another, and considered more practical approach, is to construct a low cost maintenance facility at the unit itself. An example of a low cost suitable facility is illistrated in Figure E-3. The prefabricated structure, illistrated in this example, is an off the shelf item and therefore should be priced within an acceptable price range. In the event that the replacement SERV's have a system of integrated lift jacks, the requirement for the maintenance facility hoist capability, shown in the illistration, would be eliminated.

DESIRABLE SERV DESIGN FEATURES: As previously mentioned, ACV for the most part are out of their infancy and technology has advanced to a point where the designer is now able to aim a design at a particular desired mode of operation. Considering this, the MLB/SERV unit has taken two basic SERV design, the Bell Viking and Enfield Marine EM-2, and incorporated some desirable hull modifications that would provide for maximum effective use of the ACV concept for U.S. Coast Guard Search and Rescue operations. Since better than ninety percent of all CG SAR operations involve towing of one sort or another, it is considered essential that the SERV have a safe and reliable means of accomplishing this task. Additionally, it is equally important that the SERV's hull construction be rugged enough to cope with the salt ladden and often hostle marine enviornment. Also, the SERV must have maneuvering qualities that will enable it to handle the many SAR operations that occure during other than ideal conditions or places. The propulsion, electronic, and other systems componentry should also be simple enough to enable proper maintenance by the existing small boat station maintenance forces without the need for extensive additional training. It is felt that the industry can now meet the above mentioned desirable SERV characteristics with several ACV models currently in the production stage. The desired componentry, for the most part, also consists of on the shelf systems. An example of reconfiguration of a production model ACV would be to take the Bell Viking's basic hull design, (Figure D-1-A & D-1-B), reconfigure the superstructure and incorporate the use of shrouded props or ducted fans for propulsion (Figure E-4). The Viking would now be able to safely conduct stern towing operations. This same configuration may also enable the use of a small boat hoist capability, thus enabling the SERV to hoist a small trailerable boats on to its deck and piggy back the boat at forty kts plus, to a safe mooring. This is obviously a much more desirable approach than that of towing the same boat at four kts to eight kts. Other examples of this concept are illistrated in Figure E-5 & E-6 and E-7. An additional desirable feature that could be easly incorported into the hull configuration of the Bell Viking or Enfield Marine EM-2 (Figure D-6), is that of intergrated machanical/hydrolic lift jacks. Figure E-8 illistrates this with jacks in the extended position. Figure E-6 shows the lift jacks in the stowed position for operation. As mentioned earlier, in ANNEX D, the interated lift jacks, systems has been operations tested on the Austrailian Hovergen G6B (Figure D-9)

BASIC DESIGN OF SUITABLE SERV MAINTENACE FACILITY

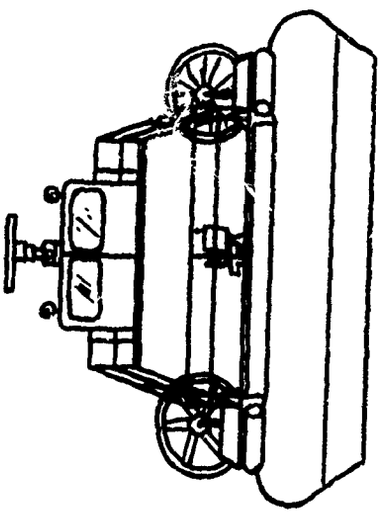


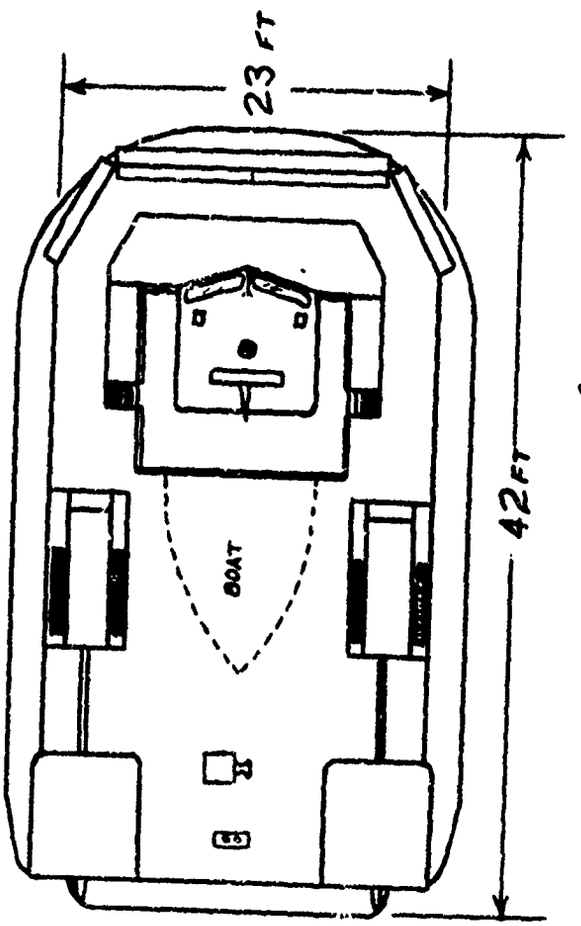
MAINTAINCE SHED CONSTRUCTED OF STEEL FRAME AND CORRIGATED ALUMINIUM SIDING ON CONCRETE SLAB.
MANUAL SLIDING DOORS
HEATING VIA GAS FIRED INFARED UNITS
METAL ARC METALHALIDE 1000WT LIGHTING

E-6

Figure E-3

PROPOSED RECONFIGURATION OF BELL VIKING





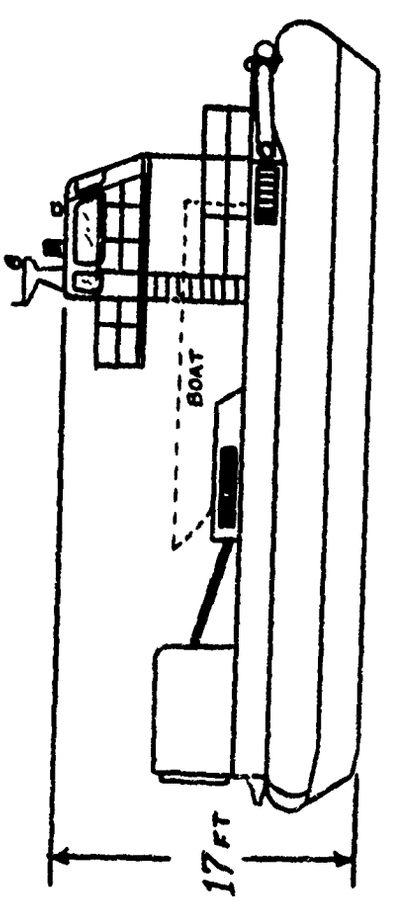


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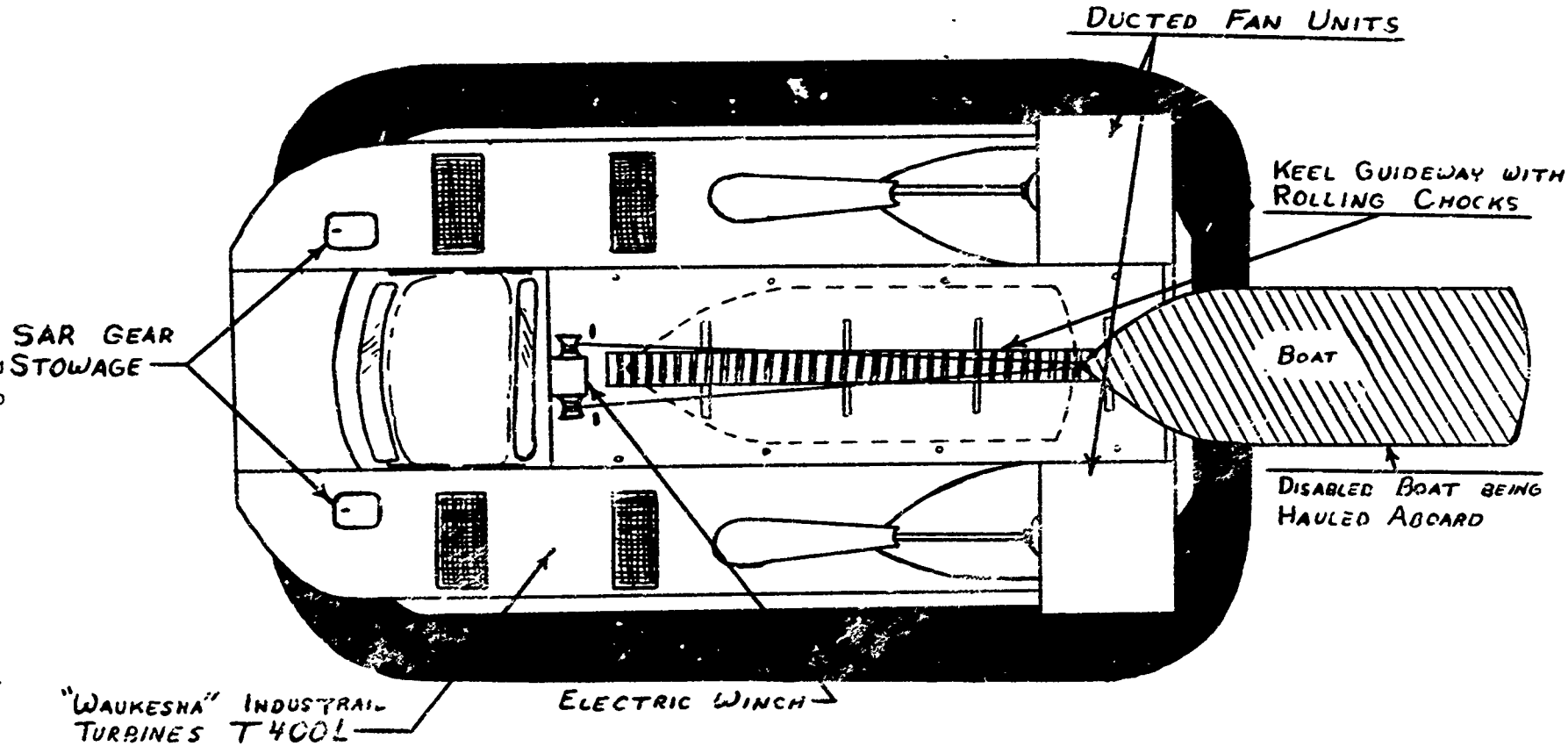
Figure E-4

TOP VEIW



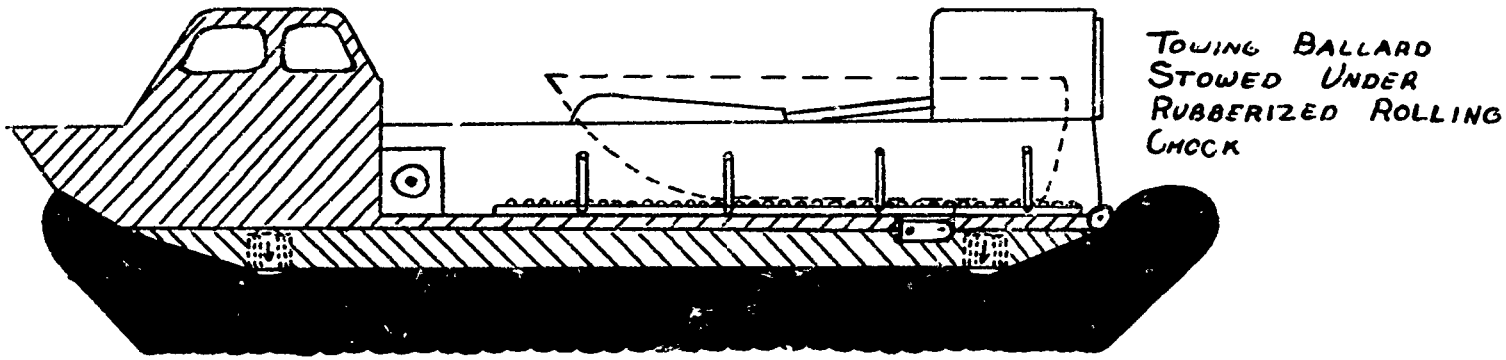
HULL FABRICATED FROM STANDARD ALUMINIUM ALLOY SHEET AND EXTRUSIONS USING SIMPLE BOLTED TYPE CONSTRUCTION

E-8

Figure E-5

CUTAWAY SIDE VEIW

CRAFT CONFEGURED FOR OPERATIONS

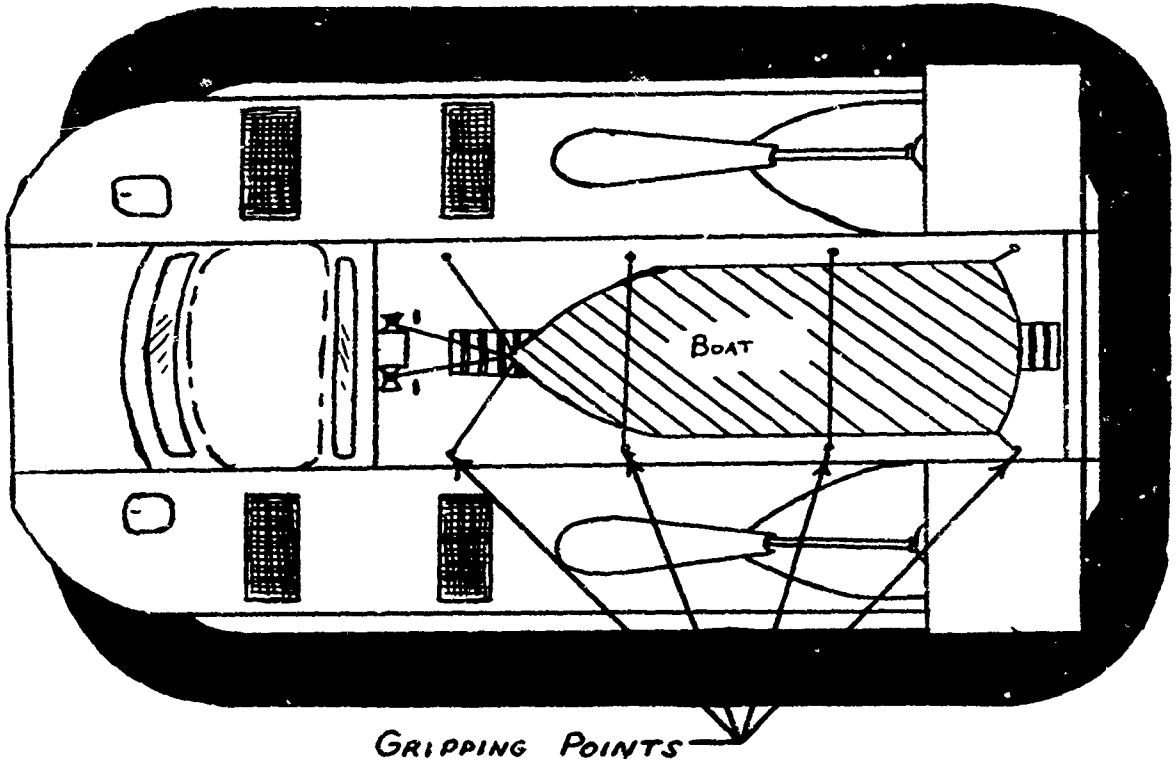


LANDING GEAR RETRACTED

Figure E-6

TOP VEIW

DISABLED BOAT STOWED ON BOARD FOR TRANSPORT



E-10

Figure E-7

CUTAWAY SIDE VEIW

CRAFT POSITIONED FOR INSPECTION

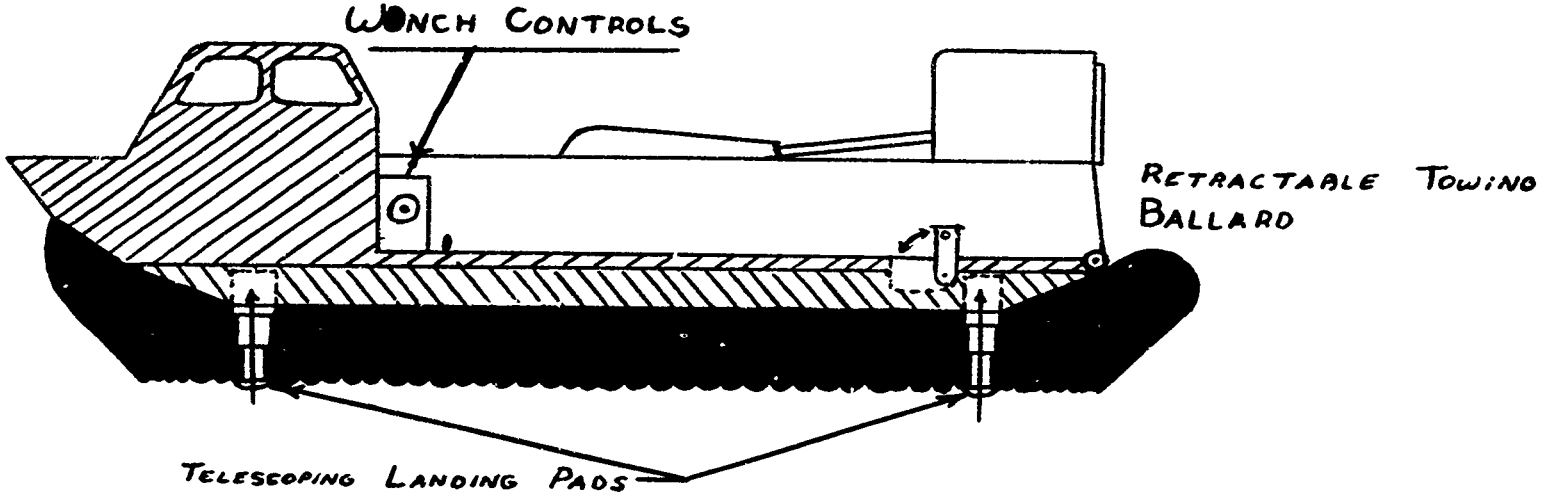


Figure E-2

ENGINE AND SYSTEMS COMPONENTRY:

ENGINES: For future CG SERV engine componentry, consideration should be given to the industrial gas turbines that embodies features of simplicity and long maintenance-free running periods. Two classic examples of this type of turbine are the Waukesha T400 (Figure D-7) and the Lycoming LTS 101, (Figure D-8). The sophistication of the LM 100 engine systems, now used on the SK-5, is not considered to be that crucial to effective SERV propulsion needs. Obviously, the more sophisticated the engine is, the greater the maintenance demands are likely to be. Both the Waukesha and Lycoming turbine engines appear to be much less demanding, as well as much less costly, to maintain. There are several other low cost industrial turbines from various other companies that would seem to be applicable for ACV application.

RADAR: The Canadian Marconi LN-66 MR currently used on the SK-5 SERV's has demonstrated exceptional reliability and therefore is recommended for future SERV use.

VHF/FM: A reliable VHF system, simular to that used in the CG Helicopters or small boats, is recommended. The system should be as weather resistant as possible and have the capabilities of accomodating an inter communications system. The ICS should be set up so that it can be switched out of the remote ICS Mode to a manual hand microphone mode of operation.

HF AM/SSB: This system, like VHF FM, should be weather resistant as possible. The system now used on CG small boats, modified for ICS, should be adaquate.

UHF: The recommendation for a UHF unit is the AN/ARC51, or a unit with comparable capabilities. This particular system has ICS integration already encorporated and when properly mounted has the weather and vibration resistance qualities required.

ADF: The AN/ARN 73 ADF unit is recommended. This particular unit has proven to be a valuable asset in the water SERV navigation. This particular unit was used extensively in the ACV Evaluation Alaskian operation, primarly for locating the ice camps that were set up on drifting ice flows. On several occasions it was the sole navigation means on board the SERV. Another reason for recommending an ADF over an RDF, is the speed at which the SERV is capable of traveling. The quick fixing capabilities of the ADF is essential to this type of navigation on the SERV.

ICS: An ICS system, such as that used in CG helicopters, is recommended. Additionally, weather resistant ICS positions should be provided at selected exterior locations within the general work area.

GUARD RECEIVERS: The guard receivers for the internation distress frequency should also have ICS monitoring capabilities.

In general, all electronics equipment should be shock mounted. The equipment should also have a quick release connector in lieu of hard wire installation. This enables the use of exchange equipment, and lessens craft marginal operation time because of downed electronics equipment.

ELECTRICAL SYSTEM AND COMPONENTRY:

COMPASS SYSTEM:

WET COMPASS: An aircraft type wet compass is considered best, as it is small and gives maximum reliability while taking up a minimum of space.

GYRO-COMPASS: This compass should be a small light weight (solid state) system of the type used in small aircraft of the civilian or military type.

MAIN POWER SYSTEM: A 28 volt 150 amp. generating system should be used and should have an over voltage protection provision encorporated. All of the systems should be fused for added protection. All critical systems should have an additional circuit protector, such as a circuit breaker.

BATTERIES: The SERV batteries should be Ni-Cad type and of sufficent size to start the engine or engines without APU assistance. The reason for using Ni-Cad batteries is because of the batteries high out put rating and low weight ratio, as compaired to lead acid batteries with simular out put capabilities.

WIRING SYSTEM: All wiring should be of the weather resistant cable type. It should be connected with AN connectors (cannon plugs). All wiring that connot be installed in this manner should be marine type wire with a suitable marking system to indicate each electrical system.

ENGINE ELECTRICAL PROTECTION SYSTEM: All engine protection circuits should be of the warning type, flashing light or buzzer etc. and have no bearing on the engines operations. The only exception to this would be the automatic engine temperature shut down in the case of turbine plants.